Suncor MacKay River Project
2016 AER Performance Presentation

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Agenda

- Introductions
- Sub Surface Presentation:
  - Birch Channel and groundwater discussion
- Surface Presentation

Suncor MacKay River Project
2016 AER Performance Presentation: Subsurface
Commercial Scheme Approval No. 8668

November 25, 2016
Reporting Period September 1, 2015 – August 31, 2016

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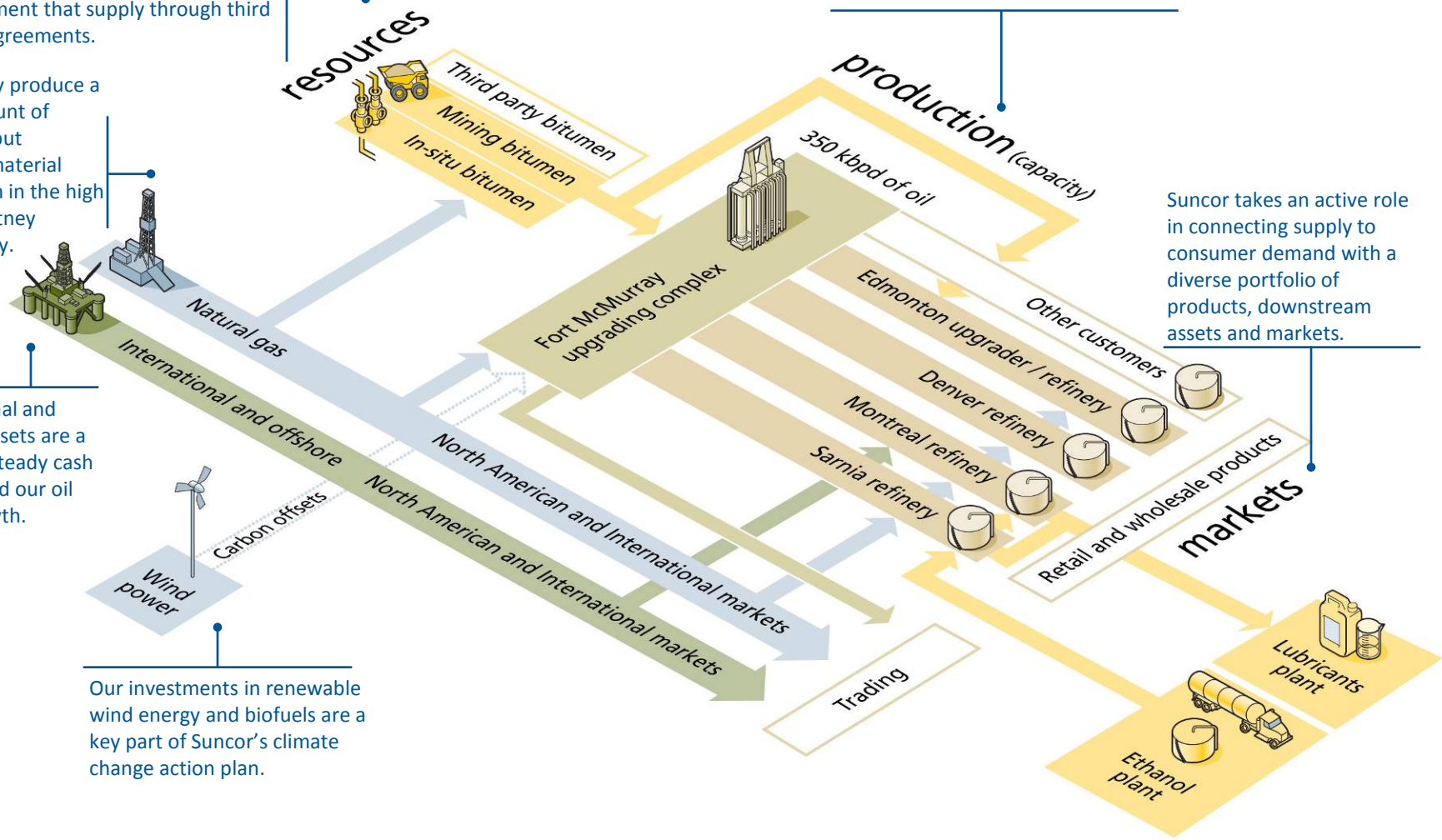
The Suncor Strategy

To provide greater reliability and flexibility to our feedstock supplies, we produce bitumen through mining and in-situ recovery technologies and supplement that supply through third party agreements.

A staged approach to increasing crude oil production capacity allows Suncor to better manage capital costs and incorporate new ideas and new technologies into our facilities.

We currently produce a limited amount of natural gas but maintain a material land position in the high quality Montney resource play.

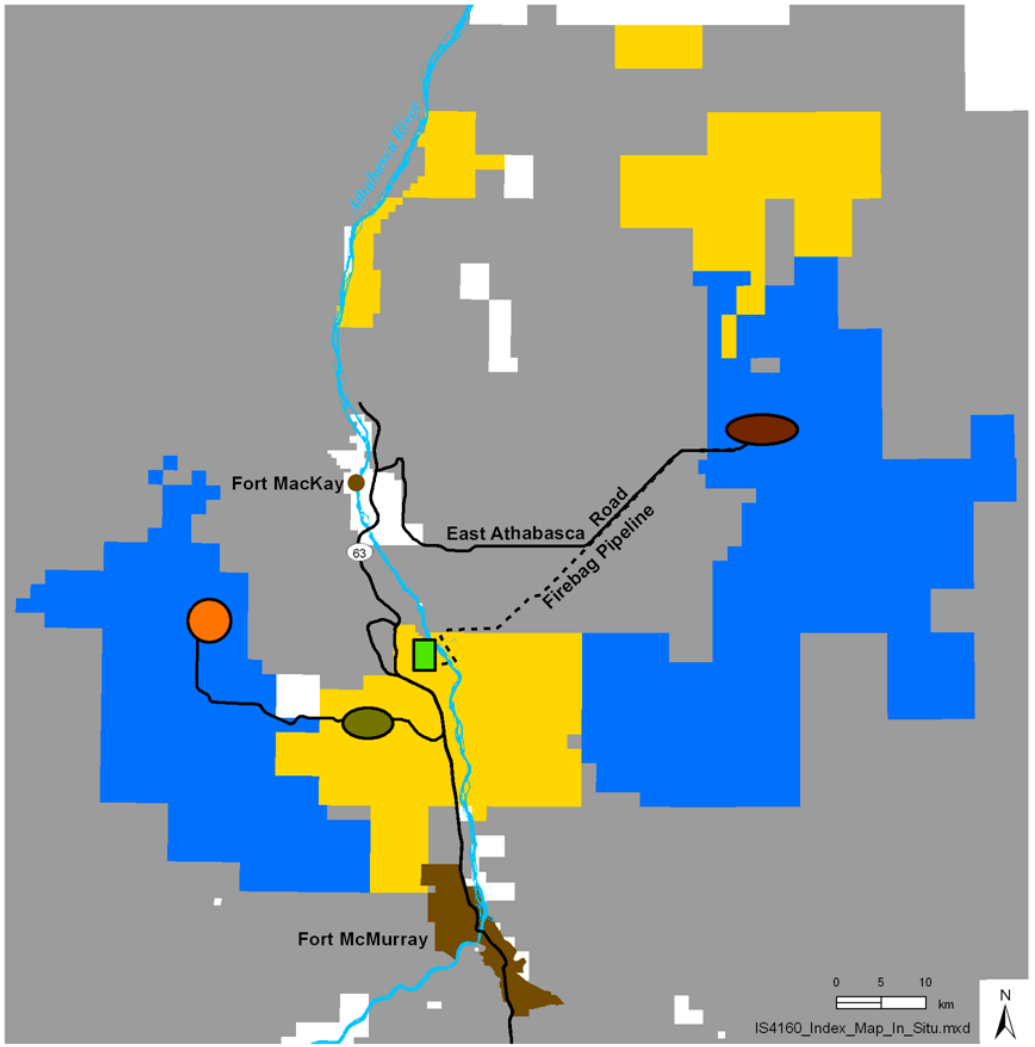
Suncor takes an active role in connecting supply to consumer demand with a diverse portfolio of products, downstream assets and markets.



International and offshore assets are a source of steady cash flow to fund our oil sands growth.

Our investments in renewable wind energy and biofuels are a key part of Suncor's climate change action plan.

Suncor has high quality leases in close proximity



- Suncor Mining Leases
- Suncor In-Situ Leases
- Suncor Base Plant
- Voyageur South Mine
- Firebag
- MacKay River
- Other Oil Sands Developers

AER Directive 054
2016 Performance Presentation

Section 3.1.1 – Subsurface Issues Related to Resource Evaluation and Recovery

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MacKay River Project Overview

- Company's first operated SAGD facility - located 60 km NW of Ft. McMurray;
- Current Approved Bitumen Production Rate 11,600 m^3/d (73 kbpd);
- Adjacent to Suncor Dover (UTF/AOSTRA) Project;
- Horizontal production wells are placed in the McMurray Formation at a depth of 98 – 145m from surface;
- No extensive underlying water or gas over bitumen issues in current development areas;
- Initial development had 25 well pairs with first steam in September 2002 and first production in November 2002 (Phase 1);
- 112 well pairs have been subsequently added.

Producing	98
Non-Producing	37
Abandoned/Planned for Abandonment	2
Total	137

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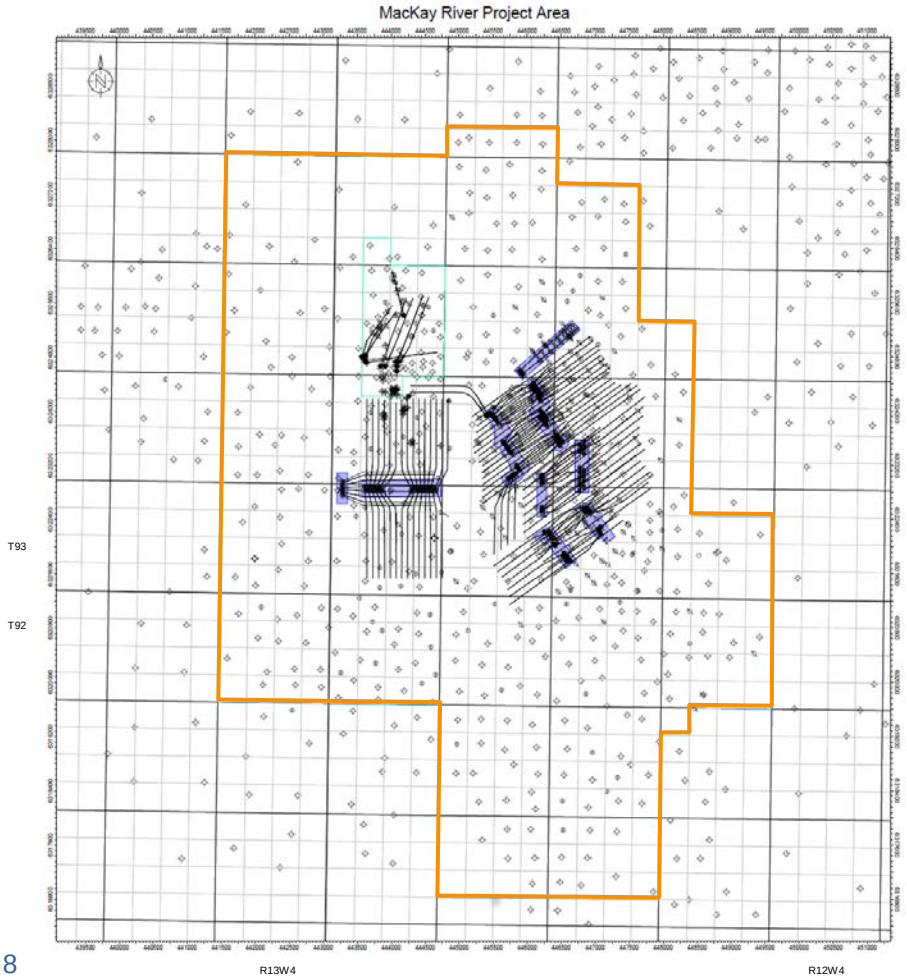
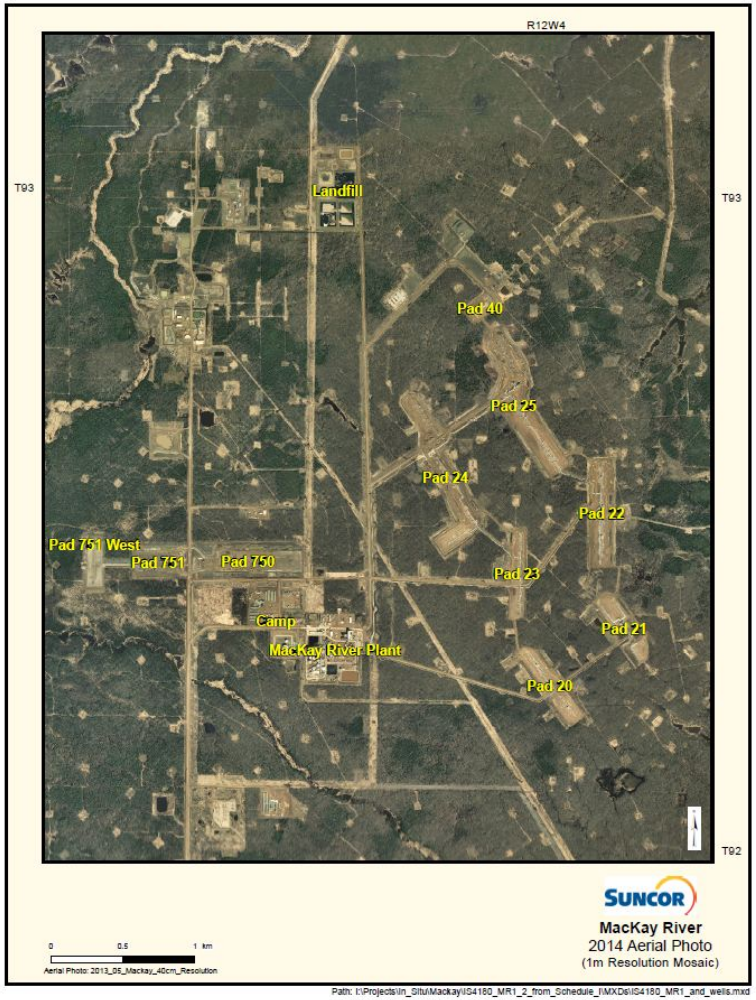
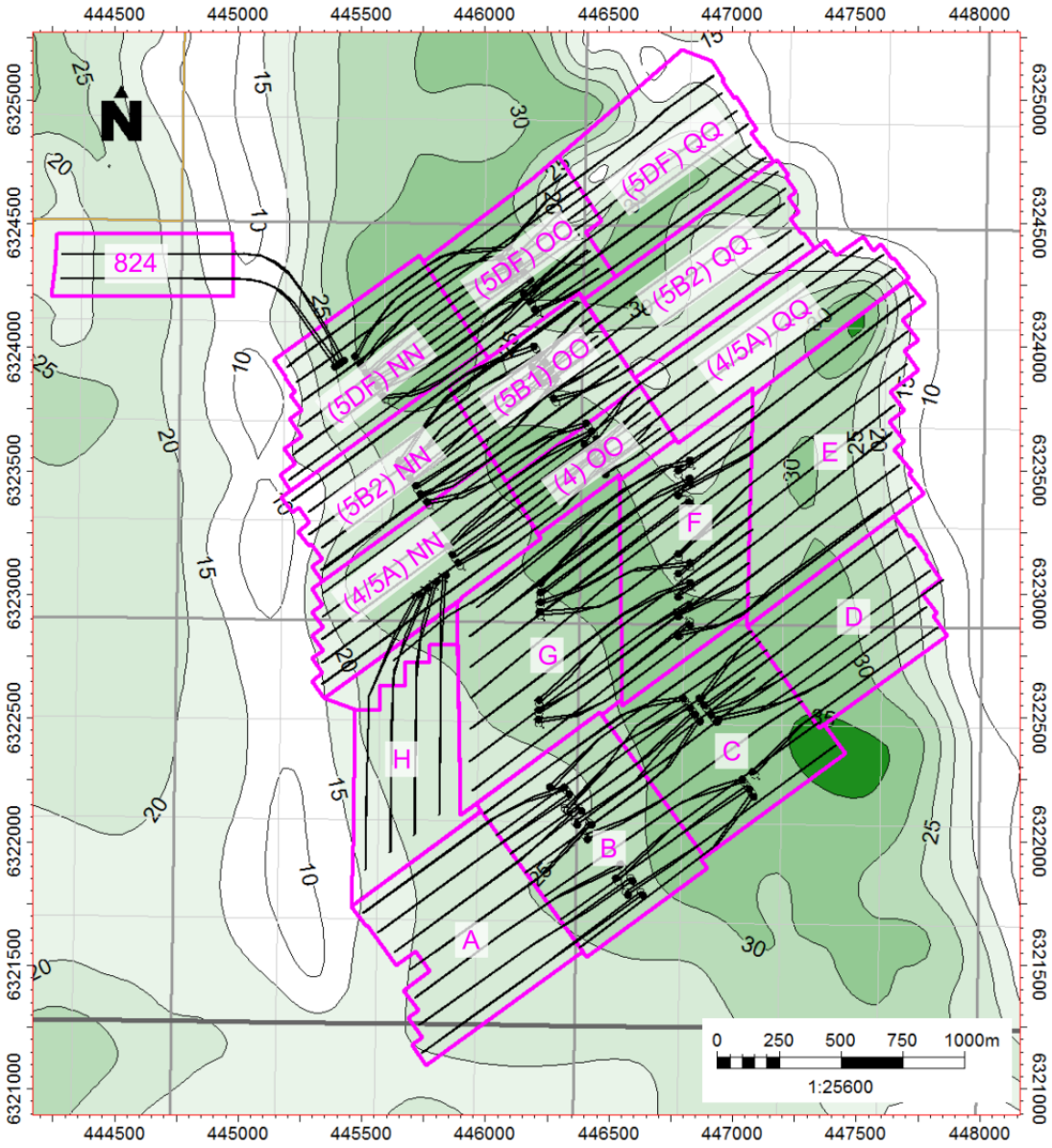
Project Area and Project Site

- Current Project Area (PA) approximately 24 ½ sections.





Wellpads and Subsurface Patterns



98 producing well pairs at MacKay River (up to 824).

MacKay River Well Spacing

- Optimal well spacing is evaluated for each new development.

Scheme Approval Amendments

- **Amendment 8668A**
  - Changed annual average volume to 33,000 bpd (5,250 m^3/d)
- **Amendment 8668B**
  - Increase to project area
- **Amendment 8668C**
  - Additional project area
  - Approval to inject non-condensable gas
- **Amendment 8668D**
  - Additions to project area
  - Increase to annual average volume to 72,964 bpd (11,600 m^3/d)
- **Amendment 8668E**
  - Approval to drill four well pairs
- **Amendment 8668F**
  - Approval to change approval holder from Petro-Canada to Suncor
- **Amendment 8668G**
  - Approval to undertake amendments & modifications to CPF systems
  - Approval tie-in 6 well pairs to well testing facilities
- **Amendment 8668H**
  - Approval to conduct non-condensable gas injection test on Pad 21 wells
- **Amendment 8668I**
  - Approval to conduct non-condensable gas injection at the Section 16 Test Project
- **Amendment 8668J**
  - Approval to transfer portions of the Dover project area into the MacKay River project area
- **Amendment 8668K**
  - Approval to tie-in 16 well pairs to well testing facilities
- **Amendment 8668L**
  - Approval to the remove the limiting factor of a mole percent restriction for the B Pattern non-condensable gas injection test on Pad 21
- **Amendment 8668M**
  - Approval to inject chemical into Pad 22 wells
- **Amendment 8668N**
  - Approval to abandon 3 wells and suspend 1 well on Pad 20
- **Amendment 8668O**
  - Approval to change Phase 5F well trajectories
- **Amendment 8668P**
  - Approval to develop Pads 750/751/28 and add 2 sections to project area
- **Amendment 8668Q**
  - Approval to conduct a pilot of water treatment technologies
- **Amendment 8668R**
  - Approval to abandon well G1I
- **Amendment 8668S**
  - Approval to conduct chemical injection test on Pad 21 (D-Pattern Injectors)

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Scheme Approval Amendments

- **Amendment 8668T**
  - Pad 819 Approval
- **Amendment 8668U**
  - Maximum Operating Pressure Approval
- **Amendment 8668V**
  - NCG Expansion Project and Phase 5D/F Chemical Injection Approval
- **Amendment 8668W**
  - MR CPF Expansion Project and Directive 081 Waiver Approval
- **Amendment 8668X**
  - Administrative reissue approval
- **Amendment 8668Y**
  - WHIP for Phases 5B2, 5D and 5F Patterns approval
- **Amendment 8668Z:**
  - Pad 828 change from 3 well pairs to 2 wells pairs and correction of well UWIs on Pad 21 Chemical Injection Test (D-Pattern Injectors) approval issued December 10, 2014.
- **Amendment 8668AA:**
  - Phase 1 NCG design amendment approval issued December 19, 2014.
- **Amendment 8668BB:**
  - Phase 2 and Phase 3 Chemical Co-Injection (E, F and G Patterns) approval issued January 1, 2015.
- **Amendment 8668CC:**
  - Approval for E1P Sidetrack well issued January 27, 2015.
- **Amendment 8668DD:**
  - Approval for NN6P Sidetrack well issued February 3, 2015.
- **Amendment 8668EE:**
  - Approval for VX™ multiphase meter on Pad 824 issued February 19, 2015.
- **Amendment 8668FF:**
  - Approval for NCG Test at OO5I well on pad 24 issued March 17, 2015.
- **Amendment 8668GG:**
  - Approval to conduct CO2 Co-Injection at the OO9 well pair on Pad 24 issued April 13, 2015.
- **Amendment 8668HH:**
  - CO2 Co-Injection amendment to change to OO8 well pair on Pad 24 issued.
- **Amendment 8668II:**
  - Pad 824 Thermal Compatibility Assessment approval issued July 14, 2015.
- **Amendment 8668JJ:**
  - Approval for NCG Test at OO7I issued July 29, 2015.
- **Amendment 8668KK:**
  - Approval for an alternate MOP Strategy Trial.
- **Amendment 8668LL:**
  - Approval for C2IPB Sidetrack Well.
- **Amendment 8668MM:**
  - Approval for Pad 750 Thermal Compatibility Assessment.

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Scheme Approval Amendments

- **Amendment 8668NN:**
  - Approval to increase MWHIP for all operating wells.
- **Amendment 8668OO:**
  - Approval to alter DA, DB, DC and DF Pattern MWHIPS;
- **Approval to adjust CO2 co-injection rate;**
  - Approval to extend chemical co-injection test at the D pattern wells on Pad 21.
- **Amendment 8668PP:**
  - Approval for abandonment of A3I.
- **Amendment 8668QQ:**
  - Approval to change Clause 32.

MacKay River Performance Presentation

Geoscience

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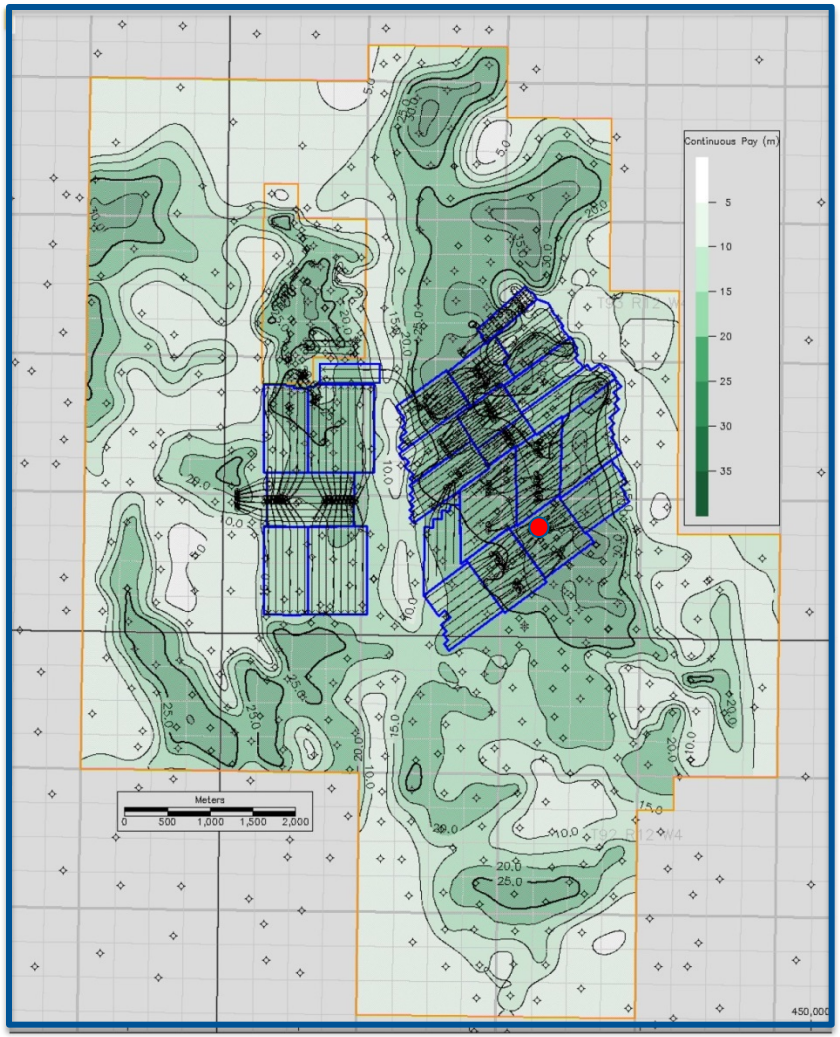
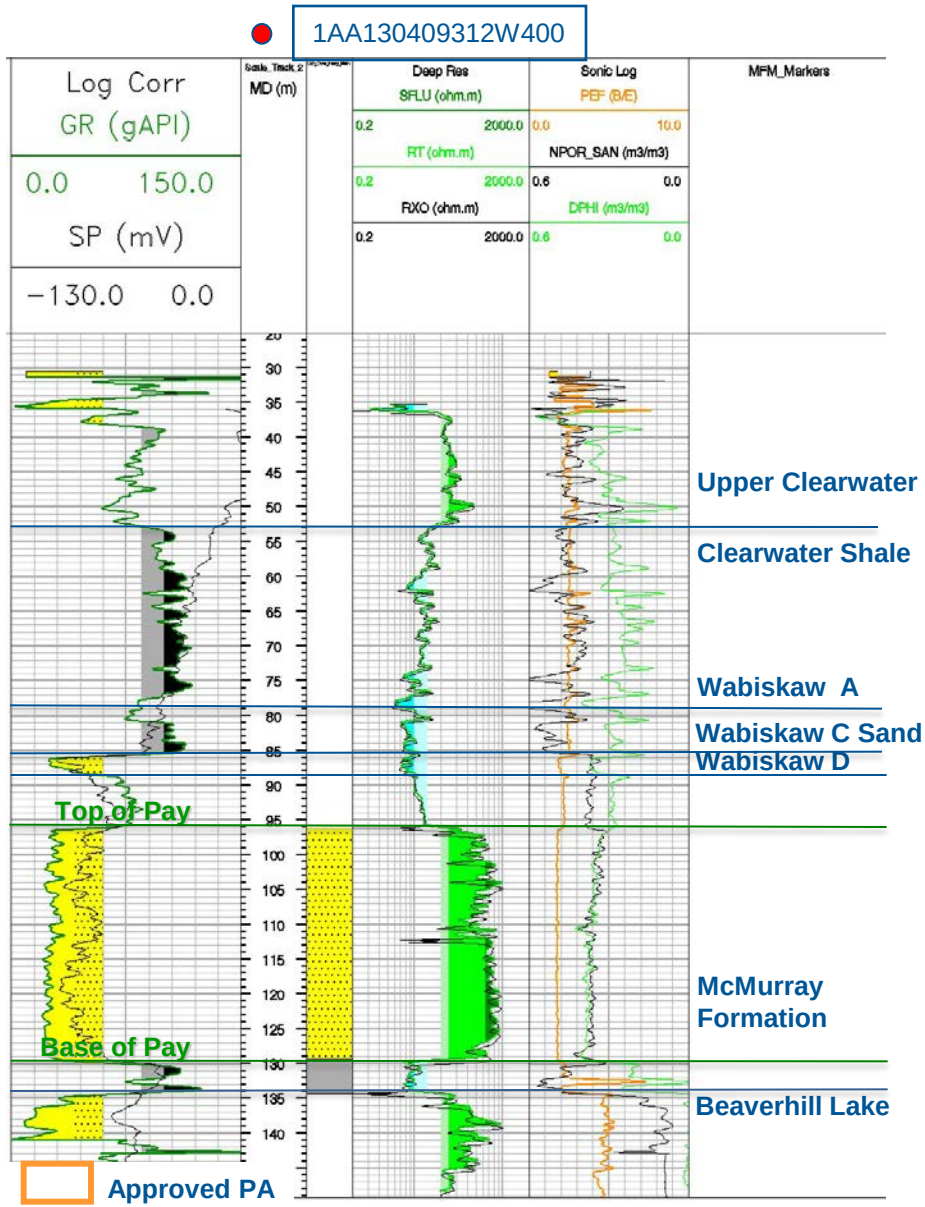
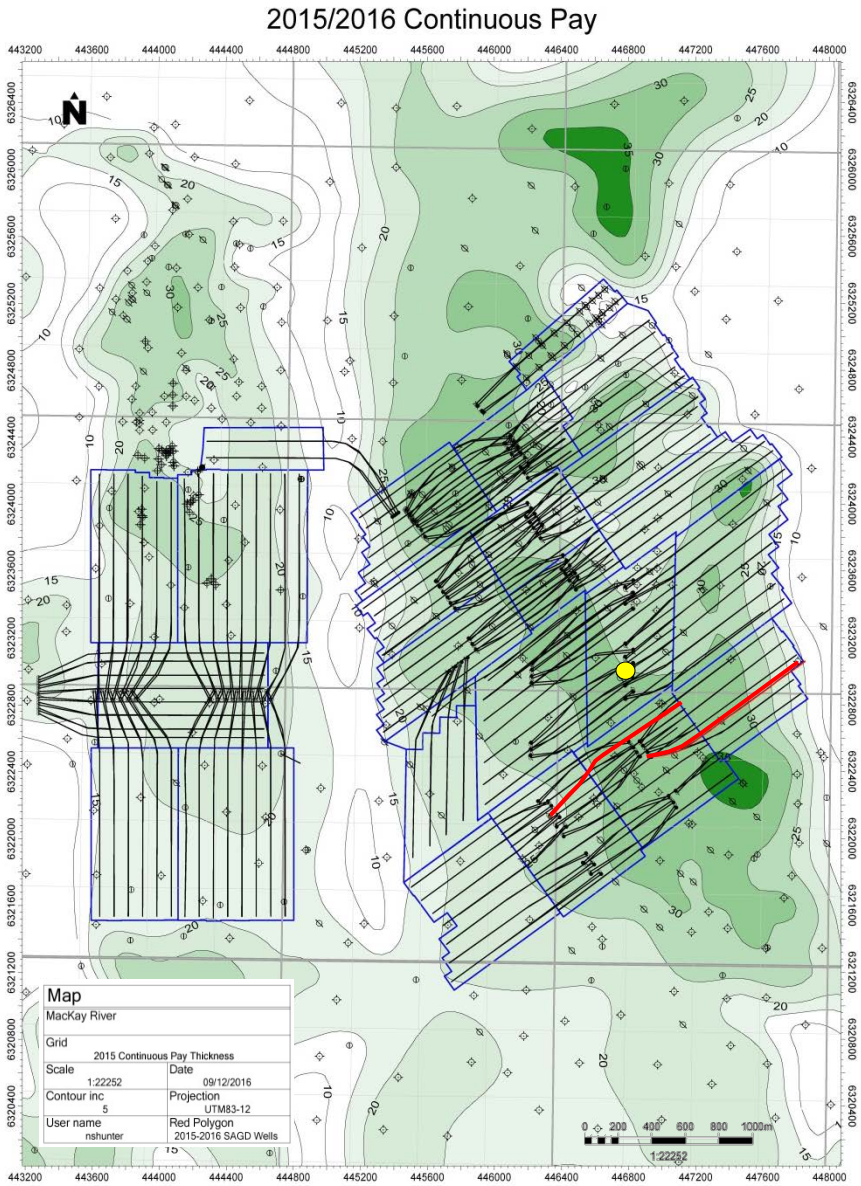
MacKay River Stratigraphy



2015 MacKay Bitumen Pay
Contour Interval = 5m



2015-16 Activities – Vertical & SAGD Drilling



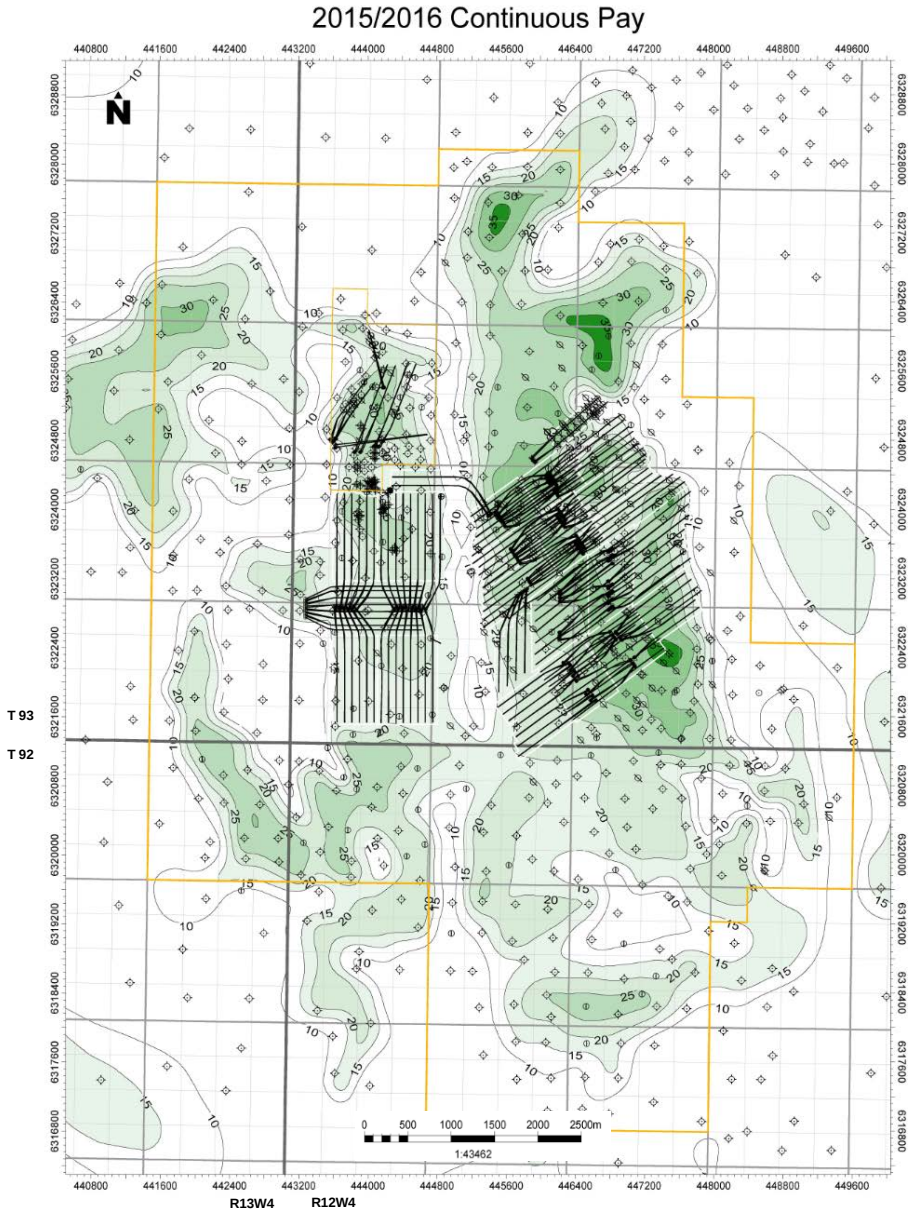
- 1 vertical wells:
  - Wabiskaw C monitoring well.
- Horizontal Wells:
  - 2 sidetracks.
- Special core analyses conducted in PA:
  - FMI.

2015/2016 MacKay Bitumen Pay
Contour Interval = 5m

Legend

- **Approved PA Boundary**
- **Existing SAGD wells**
- **2014/2015 SAGD wells**
- **2015/2016 Wab C monitoring wells**

Bitumen Pay Isopach



2015 MacKay Bitumen Pay

Contour Interval = 5m

Legend

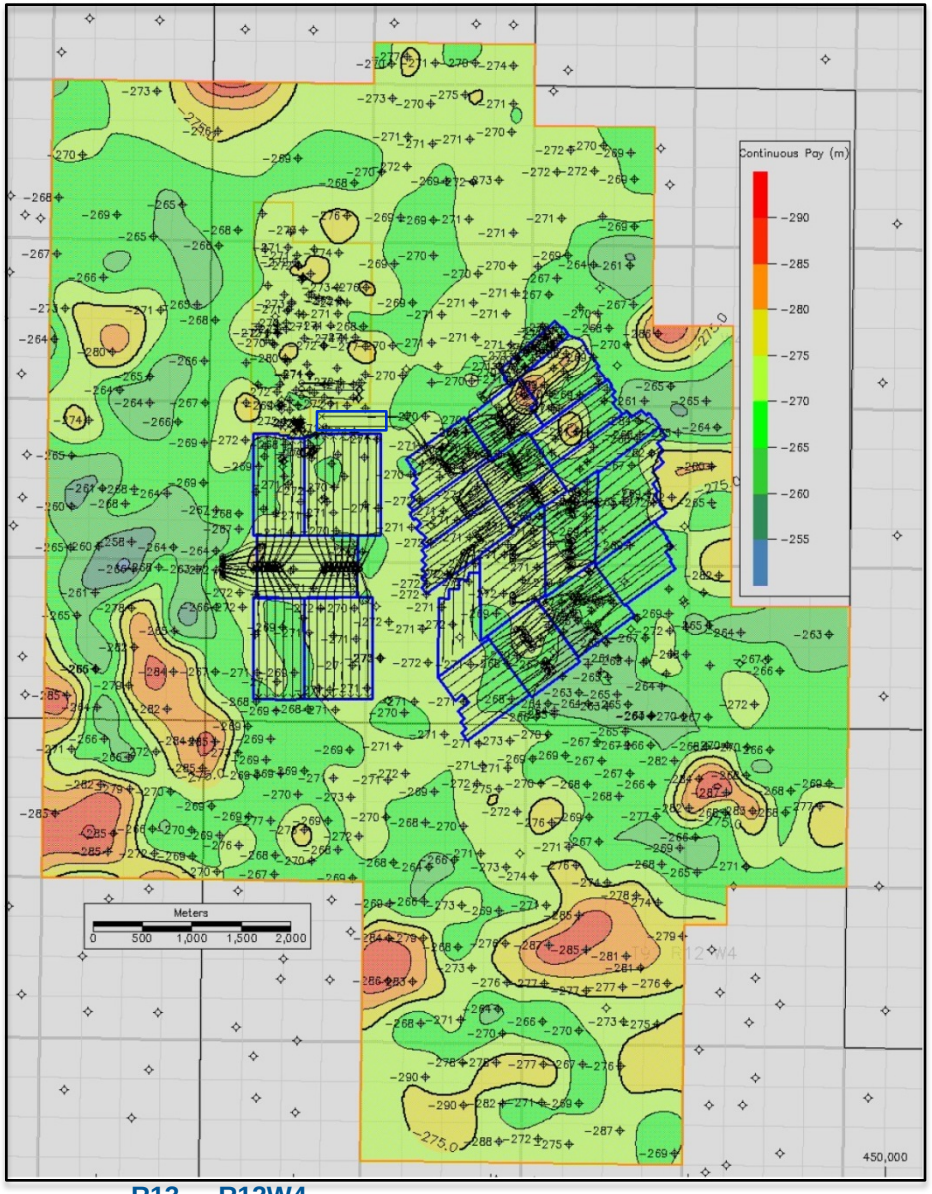
Approved PA Boundary

Contour Interval =5m

0-5
5-10
10-15
15-20
20-25
25-30
30-35
35-40
40-45

Map	
MacKay River	
Grid: 2015-2016 Continuous Pay Thickness	
Contour inc: 5	Date: 09/12/2016
Scale: 1:43462	Projection: UTM83-12

Base of Pay Structure Map



Legend

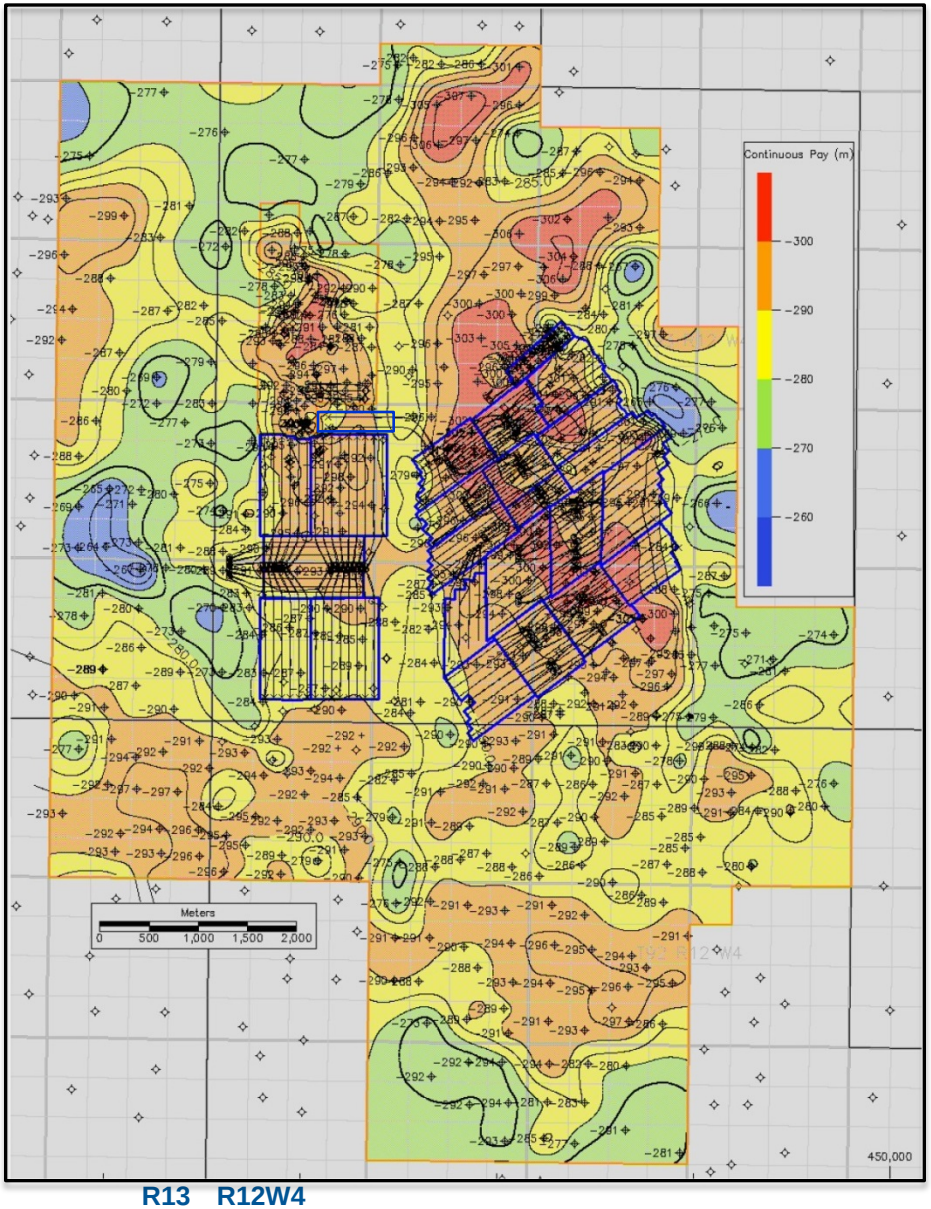
Approved PA Boundary

Contour Interval =5m

2015 MacKay Base of Pay

Contour Interval = 5m

Top of Pay Structure Map



Legend

Approved PA Boundary

Contour Interval =5m

Oil Sands Facies and Gross Bitumen Pay

Facies:
Defined by visual mud index (VMI)

Cutoffs:
F1 (Sandstone) = 0-5% VMI
F2 (Sandy IHS*) = 5-15% VMI
F3 (IHS*) = 15-30% VMI
F4 (Muddy IHS*) = 30-70% VMI
F5 (Mudstone) = 70-100% VMI
F10 (Breccia) = variable

* IHS = inclined, interbedded, sand and shale

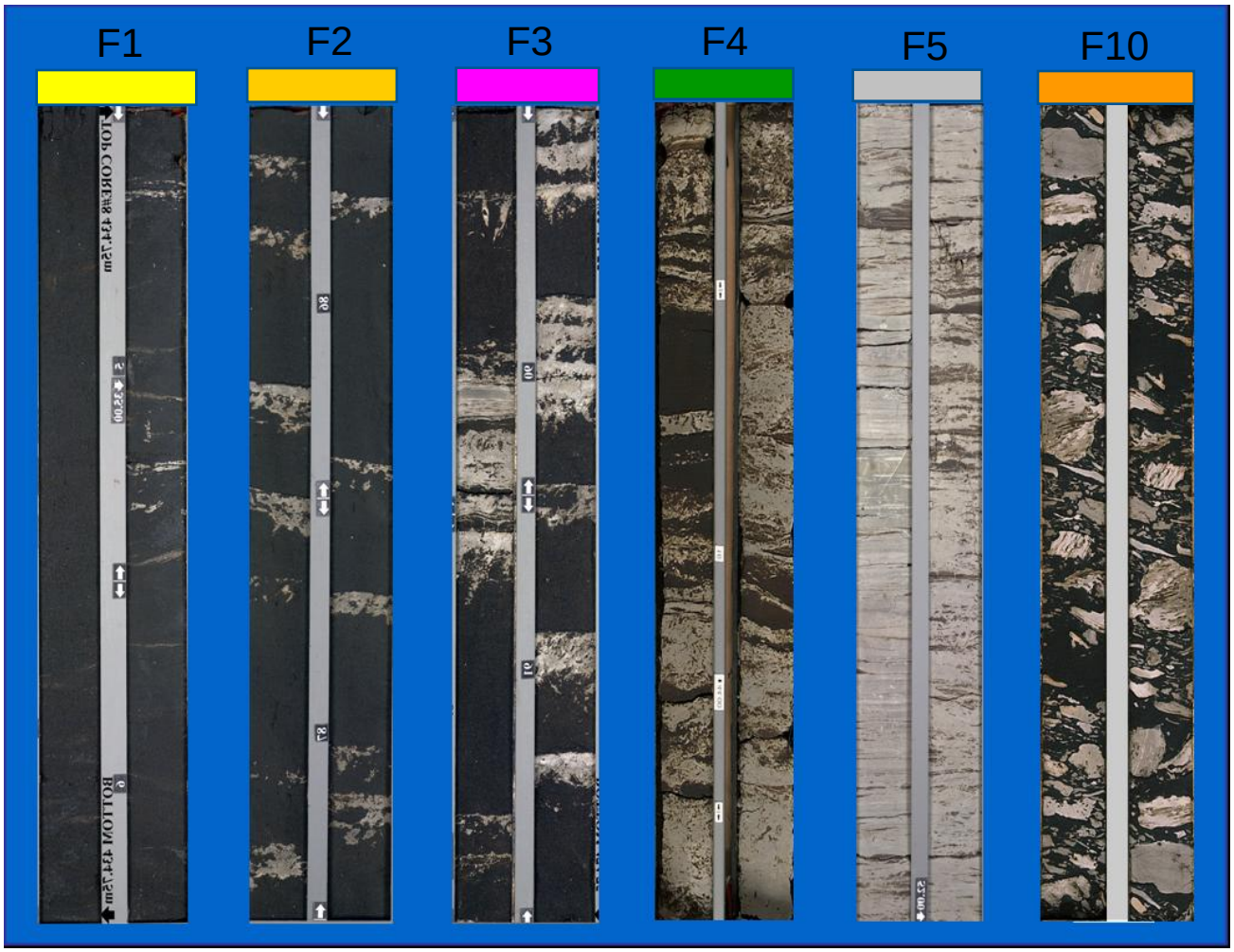
Pay:
Includes Facies F1, F2, and F10
Can include F3-F5, if < 2m thick

Weight percent bitumen > 10%

Generally > 30% Porosity
- PA averages 31.1% in clean sands

Permeability ~ 1 to 5 Darcy's

> 15m for OBIP volumetric



Pattern OBIP Calculation

Gross Rock Volume (GRV) = total rock volume derived from Continuous Pay map;

Net Rock Volume (NRV) = product of Continuous Pay gross rock volume multiplied by the average Net Sand Ratio for each area;

Net Sand Ratio (NSR) = a net-to-gross adjustment used to account for pay mapping being done on a continuous (gross) basis:

- 15% VMI (visual mud index) cutoff plus the sand component of breccia intervals.

Original Bitumen in Place = product of the Net Pay volume multiplied by the average Porosity, and the average Oil Saturation.

$$OBIP=GRV*NSR * So * Por$$

New net-to-gross adjustment using Net Sand Ratio map allows for consistent application of a mudstone cutoff while: a) avoiding adjustments based on pattern averages, and b) allowing the differential treatment of sand- versus mud-rich breccia's.

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Reservoir Properties and Base Case OBIP

Average Reservoir Properties					Volumes	
Pattern	Net Sand Ratio	So	Phi	So-Phi		OBIP(e^3m^3)
A	91%	82%	31%	26%		2,389
B	95%	86%	32%	27%		3,319
C	95%	89%	32%	29%		4,238
D	96%	91%	31%	28%		2,741
E	92%	84%	31%	26%		3,728
F	95%	89%	32%	28%		3,616
G	93%	86%	32%	27%		4,155
H	94%	84%	31%	26%		1,756
NN (Phase 4/5)	95%	85%	32%	27%		7,010
OO (Phase 4/5)	93%	84%	31%	26%		5,251
QQ (Phase 4/5)	87%	84%	31%	26%		5,581
Pad 824	87%	89%	30%	30%		684
					Subtotal	**43,784**
Total PA	**93%**	**86%**	**31%**	**27%**		**171,479**

Average Reservoir Depth = 109 m TVD, Pi = 400 kPa, Ti = 6-7 ^oC , K_{max} = 1.7-8.5 D, K_{min} = 1.1-6.5 D

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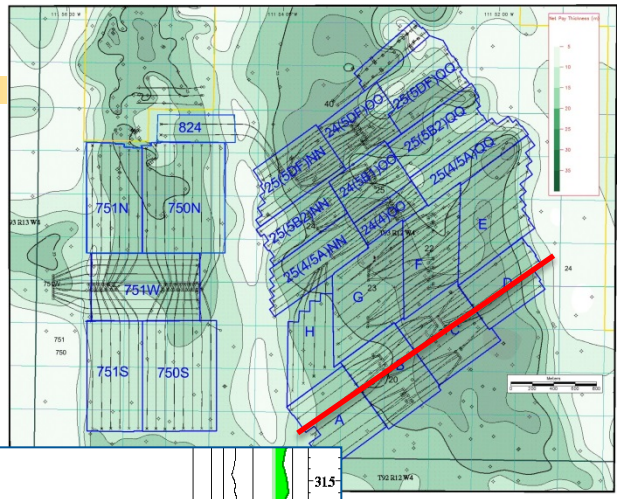
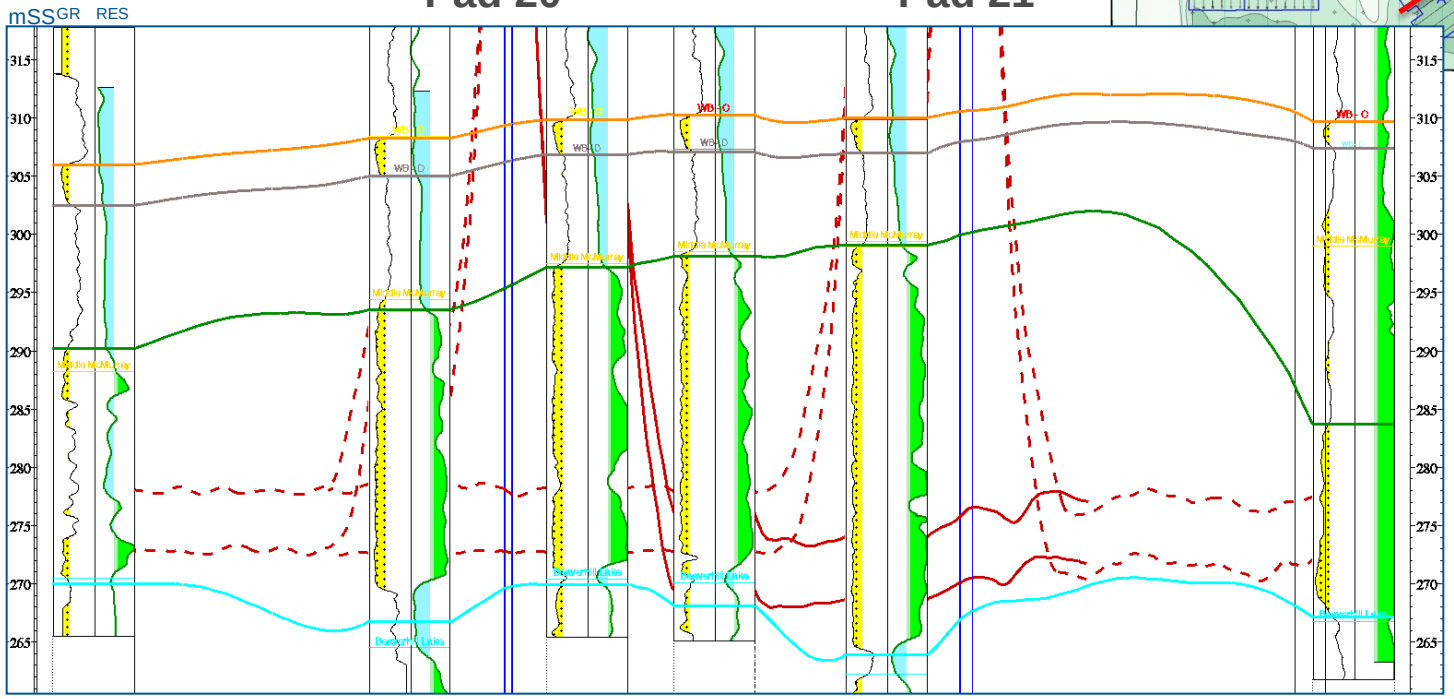
Phase 1



Pad 20

Pad 21



A Pattern

B Pattern

C Pattern

D Pattern

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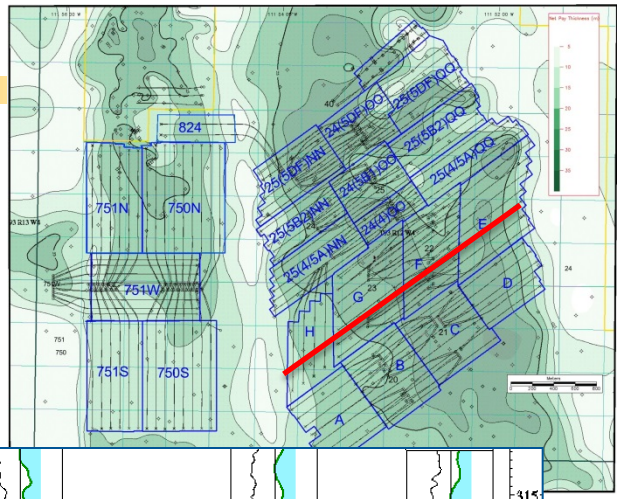
Phases 2, 3 and 4



Pad 22 Pad 23

mSS

Clearwater

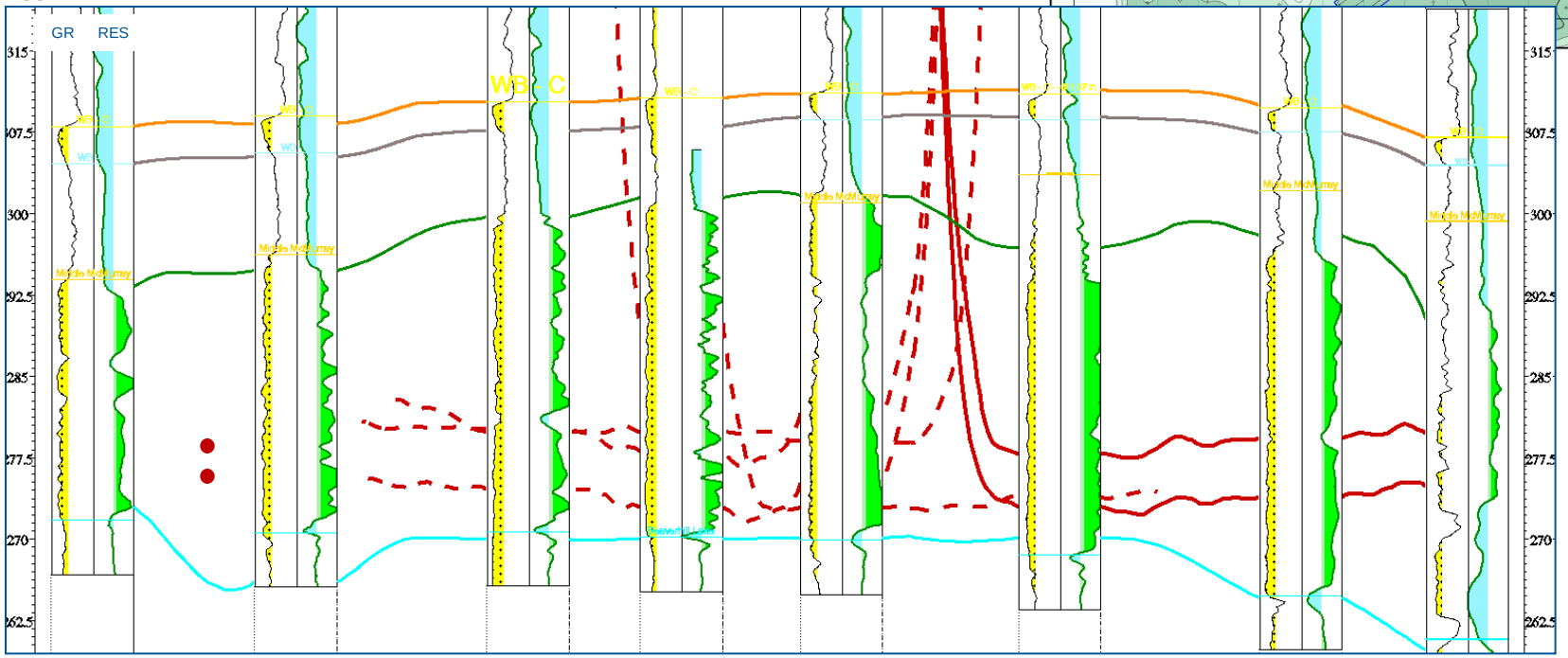
Wabiskaw C

Wabiskaw D

Top of Pay

Devonian

Beaverhill Lake



H Pattern G Pattern F Pattern E Pattern

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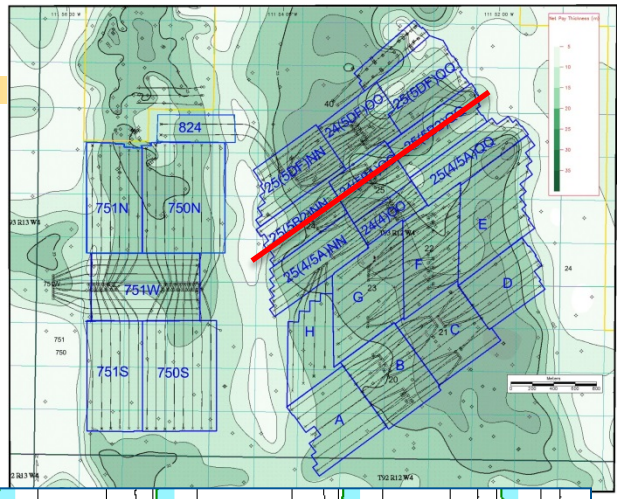
Phase 5

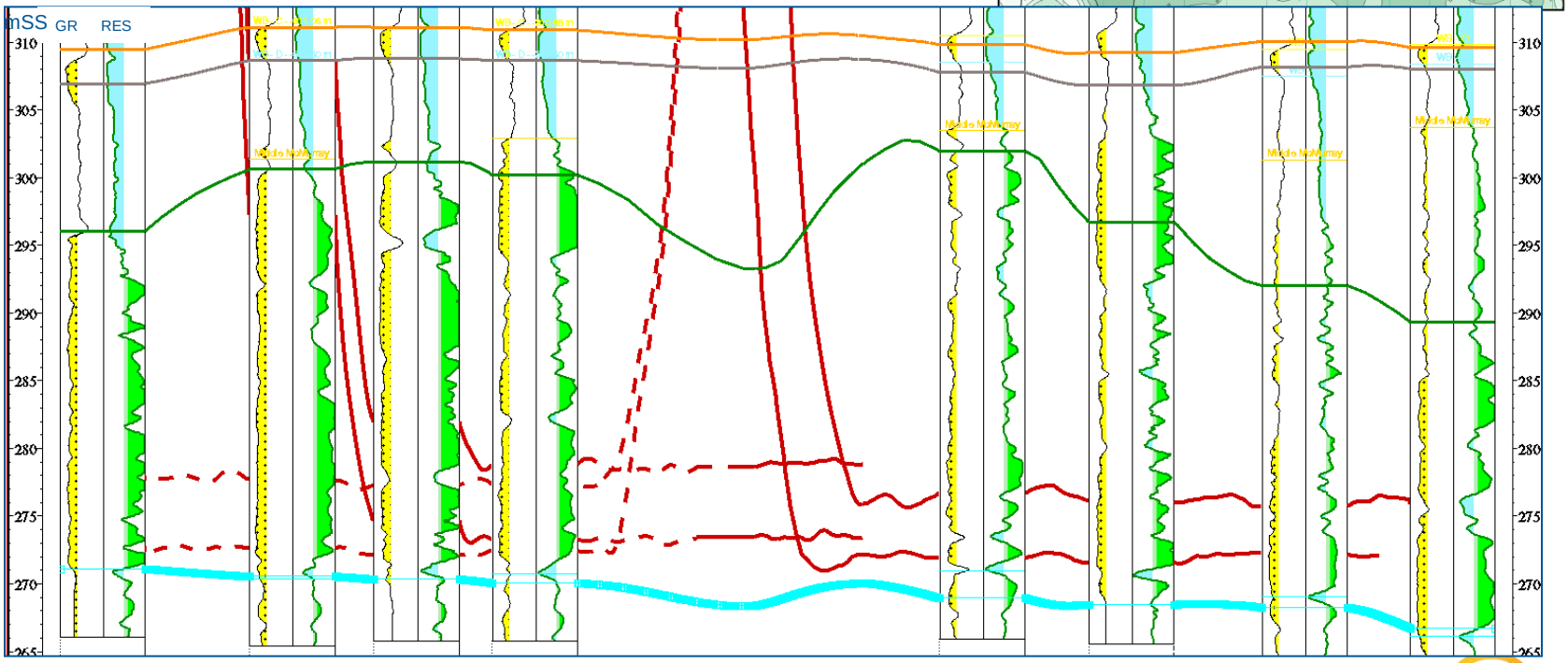


Pad 24 Pad 25

Clearwater
Wabiskaw C
Wabiskaw D

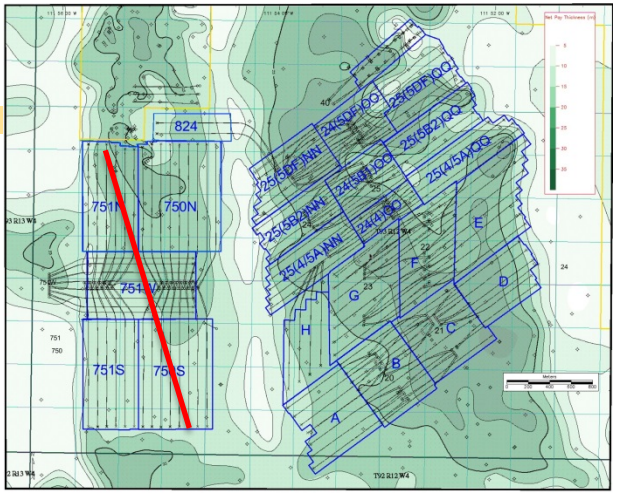
Top of Pay

Devonian
Beaverhill Lake



NN Pattern OO Pattern QQ Pattern

Pad 750/751



SE

Pad 750 Pad 751W Pad 751

NW

mSS

Clearwater

GR RES

Wabiskaw C

Wabiskaw D

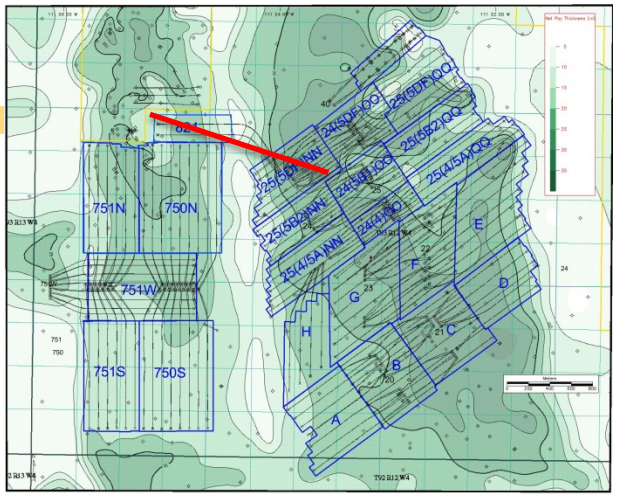
Top of Pay

Devonian

Beaverhill Lake

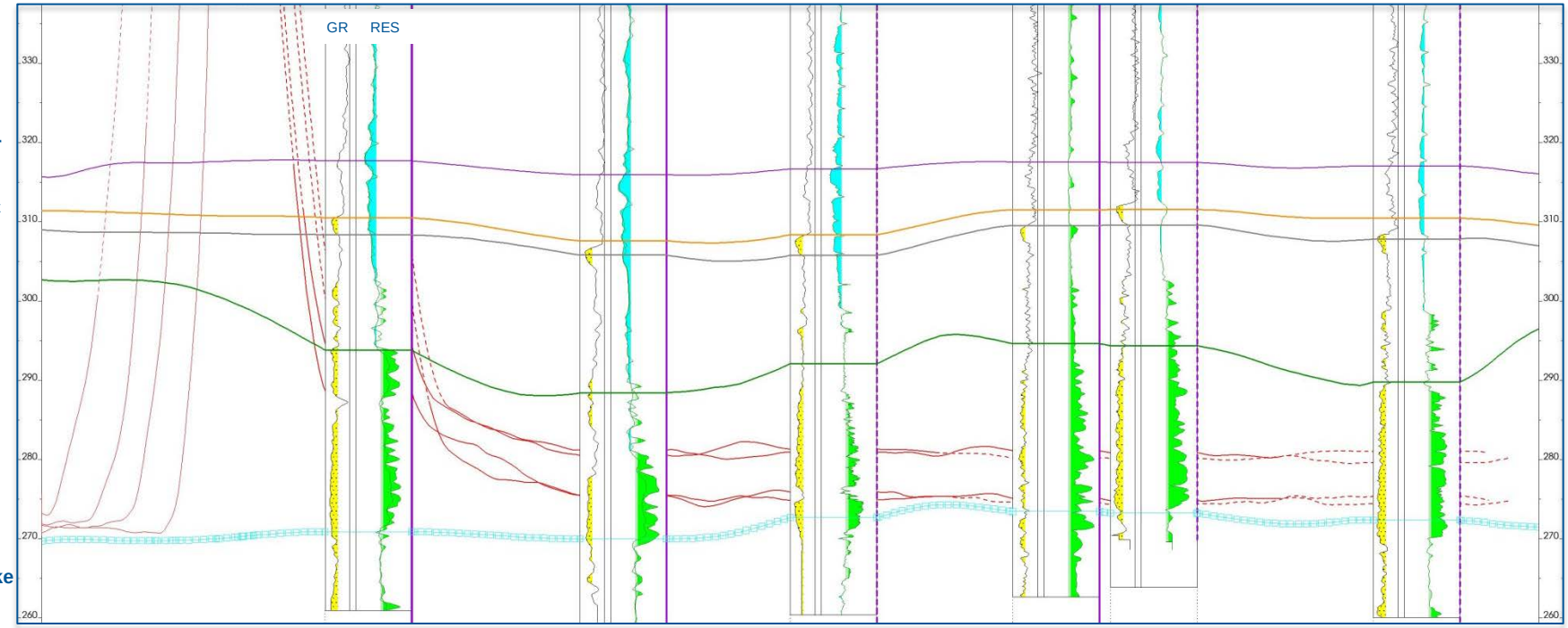
DC Pattern DB Pattern DA Pattern

Pattern 824



SE **Pad 24** **NW**

mSS



Clearwater

Wabiskaw C

Wabiskaw D

Top of Pay

Devonian

Beaverhill Lake

OO Pattern **NN Pattern** **824 Pattern**

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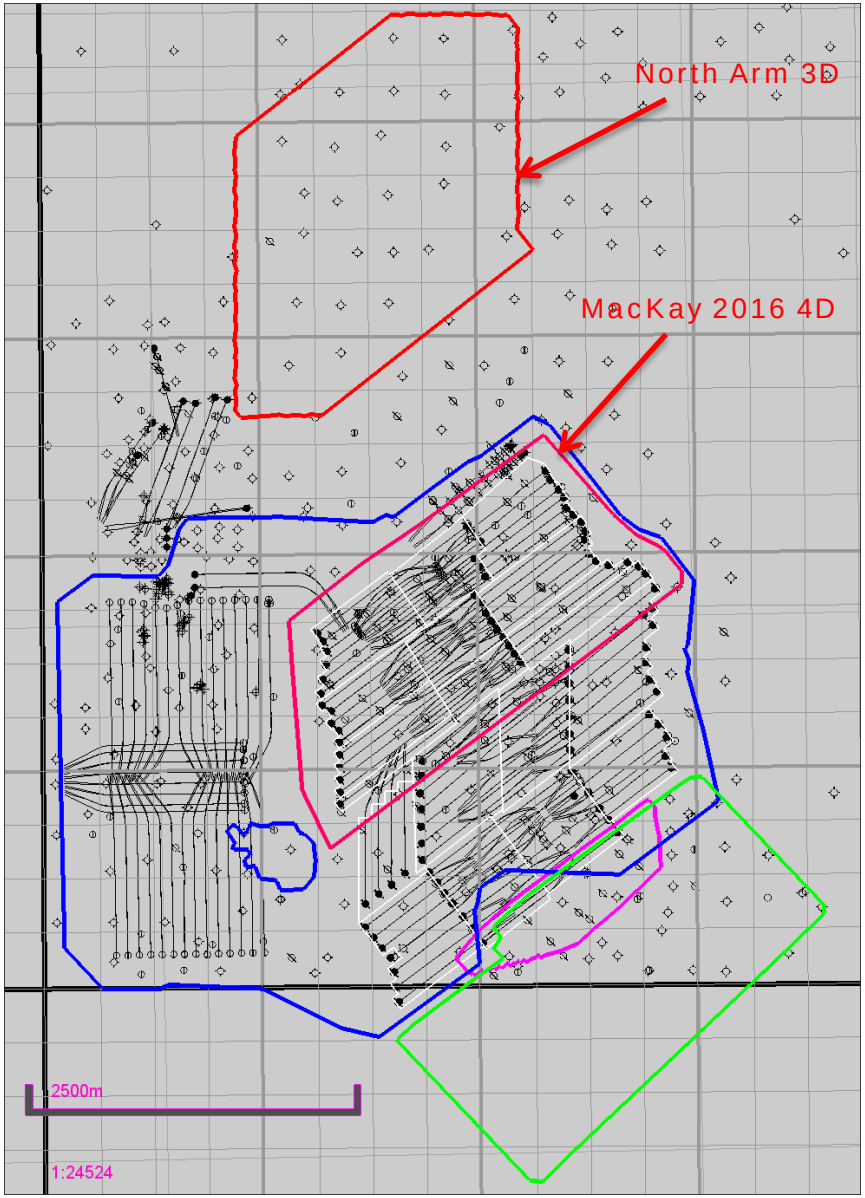
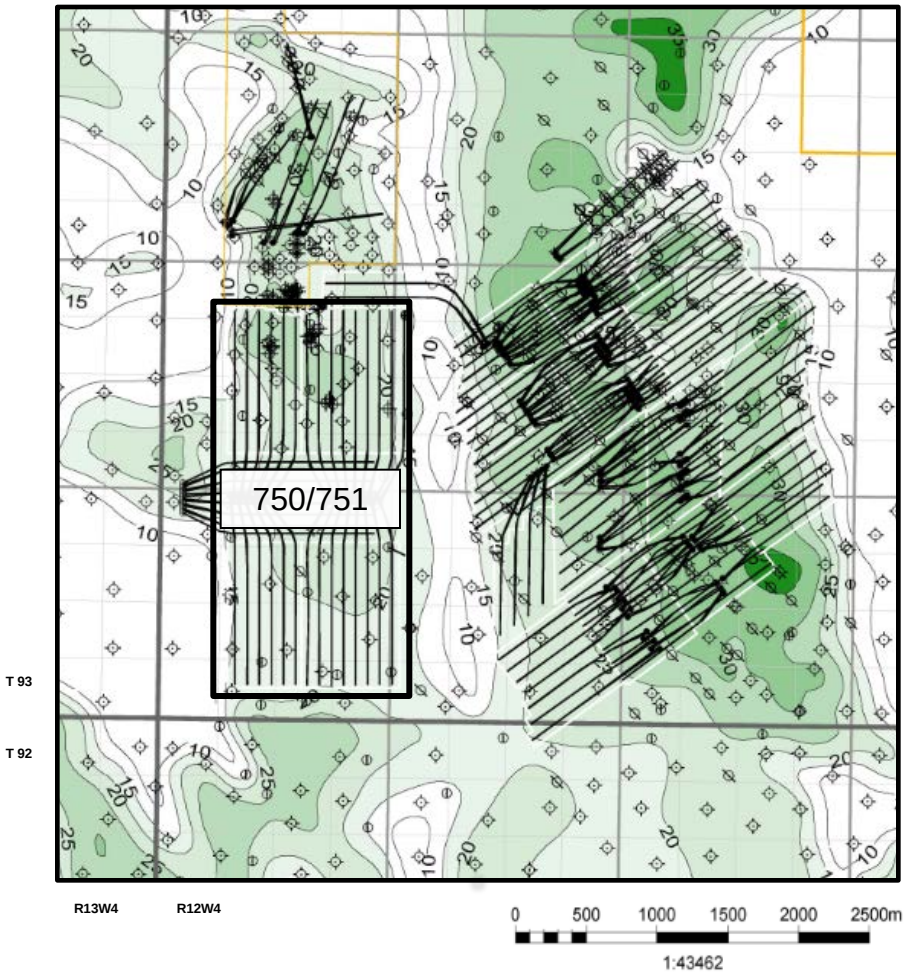
MacKay River – 3D / 4D Seismic Activity 2016



- 2016 3D Baseline acquired over North Arm to assess:
  - Caprock Integrity;
  - Reservoir Quality;
  - Base Reservoir structure.
- 2016 4D acquired over NN, OO and QQ Patterns to:
  - Aid in estimating steam chamber growth in these patterns since April 2013.

Special Core Analysis– Petrographic Analysis/Geochemistry



Geochemistry

- Suncor has collected geochemistry samples and is currently analyzing for vertical changes in bitumen degradation to tie to geologic information; and operational related data (production, Obs wells, 4D seismic).

Petrographic Analysis

- 750/751 developed in 2nd pay trend (West);
- Suncor completed additional routine petrographic work to better understand 2nd pay trend;
- As expected, sampling has confirmed a quartz dominated sand sized reservoir persists in the area with the same compositional characteristics (subarkose/sublitharenite) as current producing wells within Eastern pay trend.

MacKay River Performance Presentation

Well Operations

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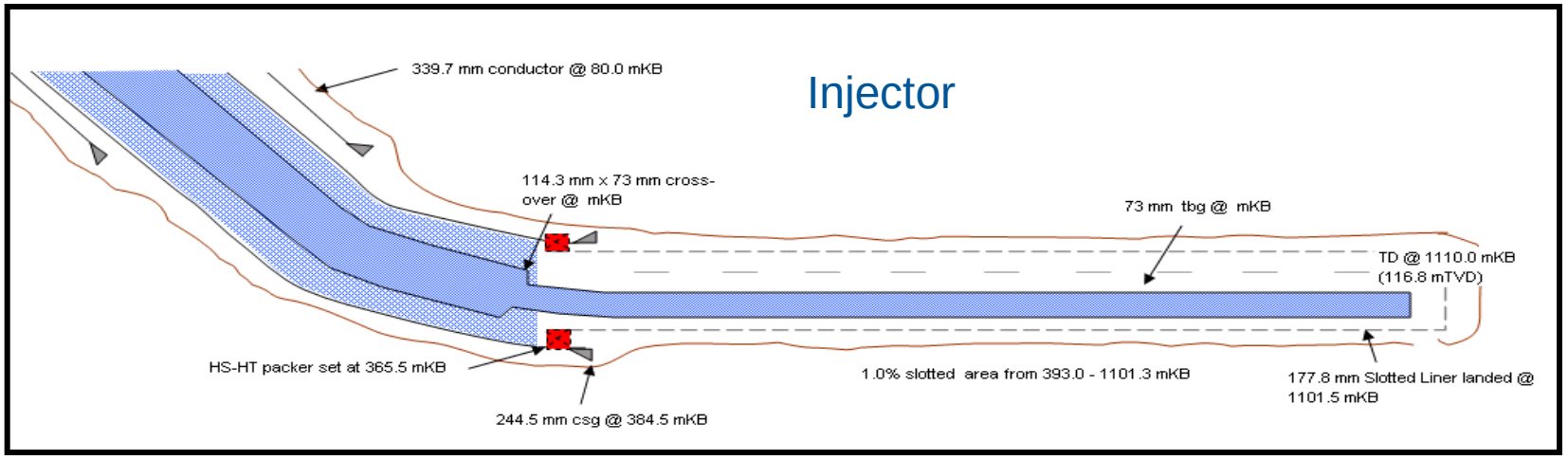
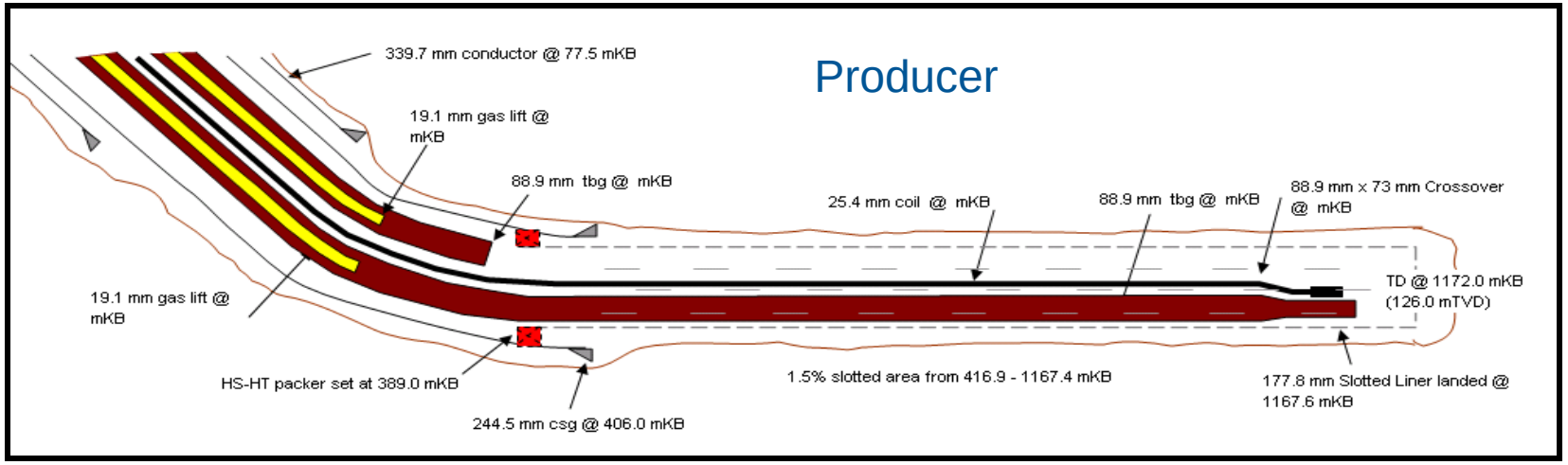
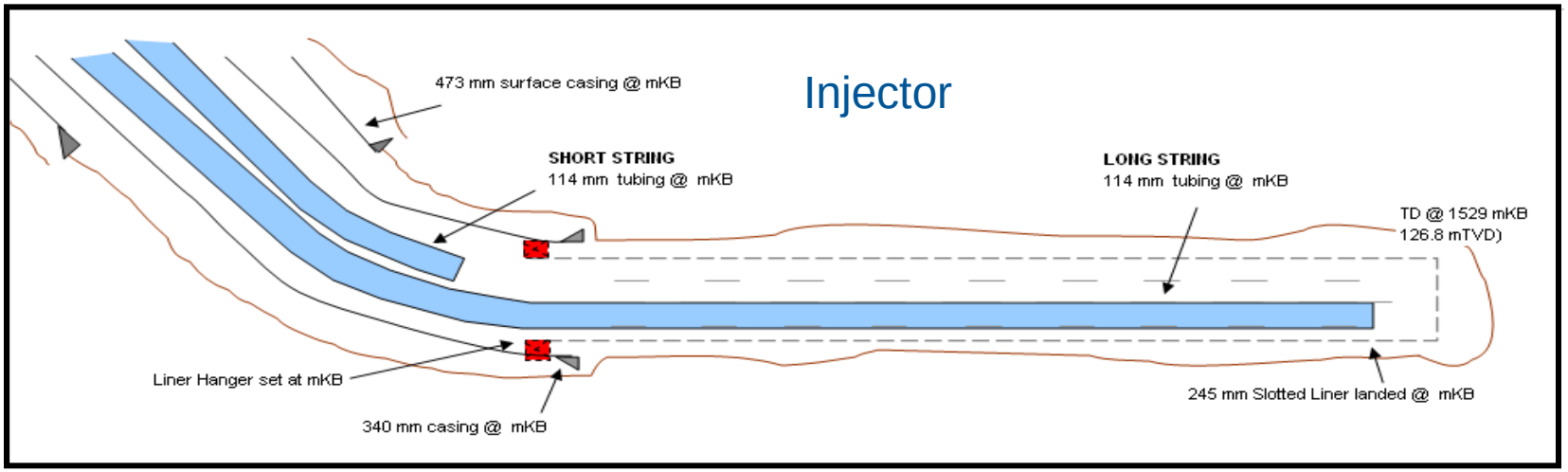
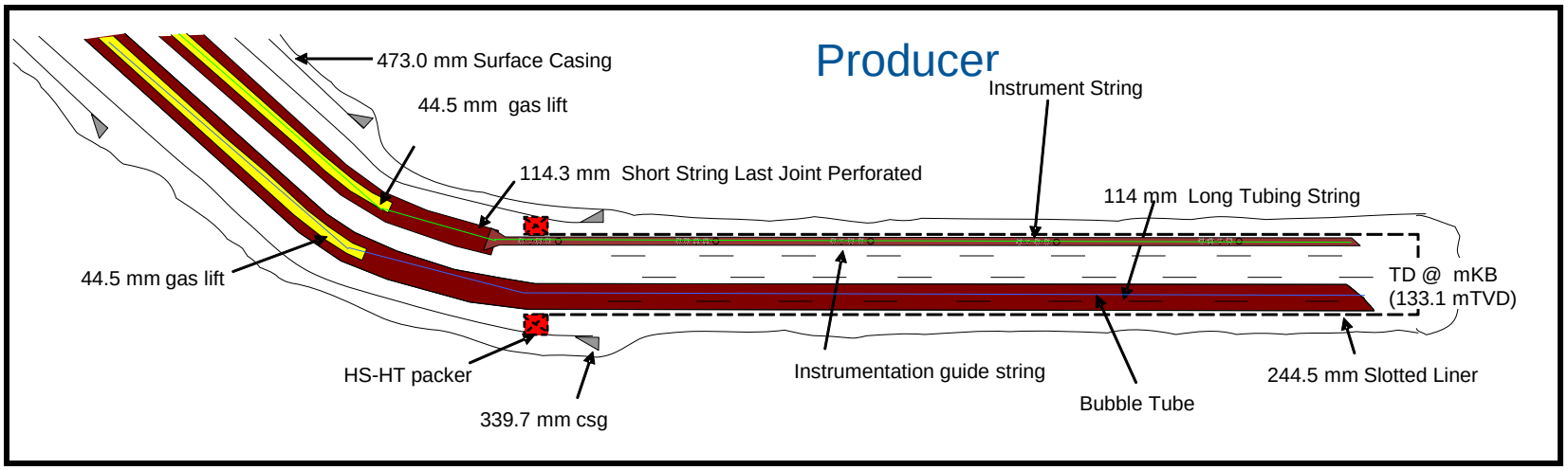
Typical Well Completions – Phase 1 Type



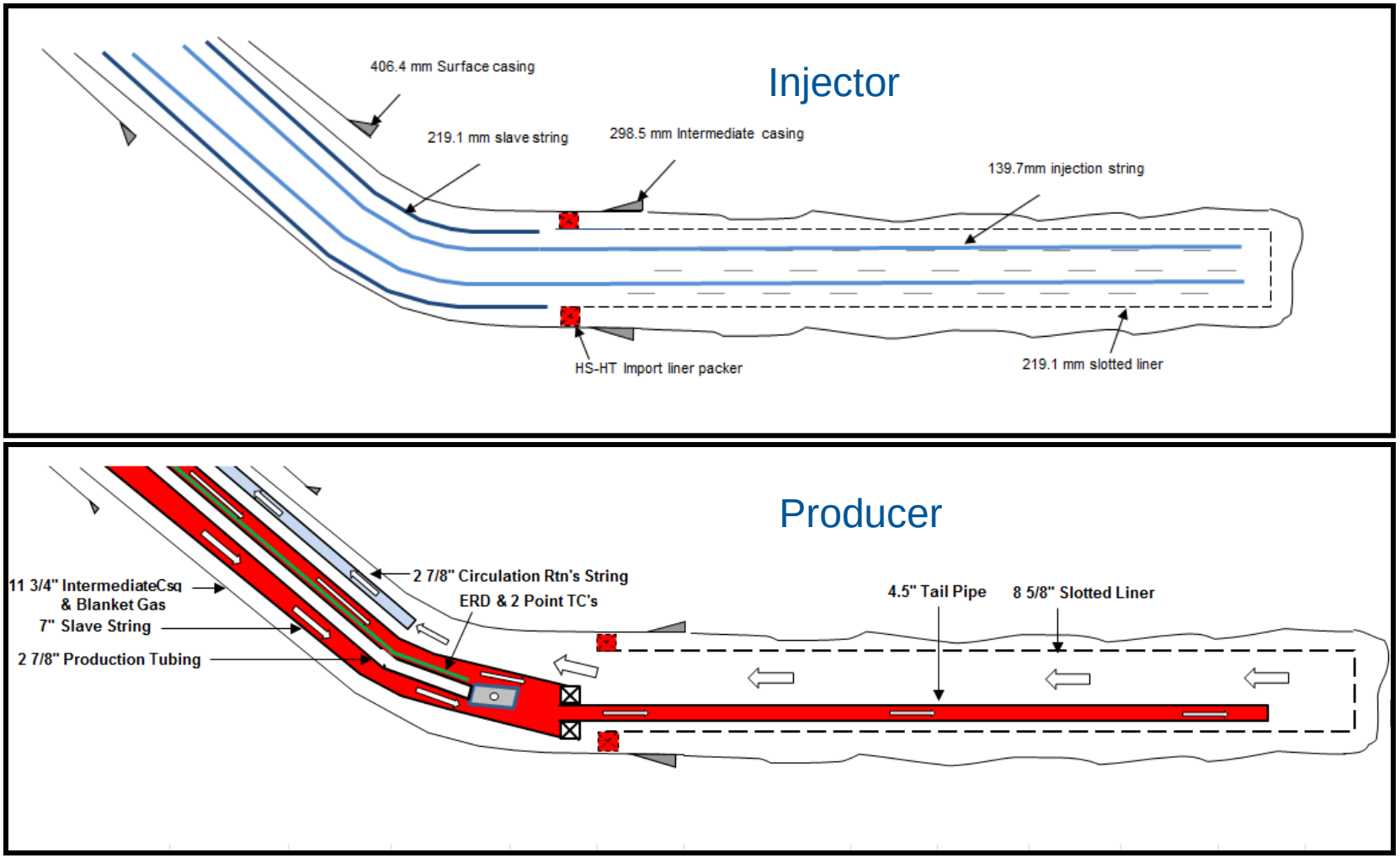


Typical Well Completions – Phase 5 Type



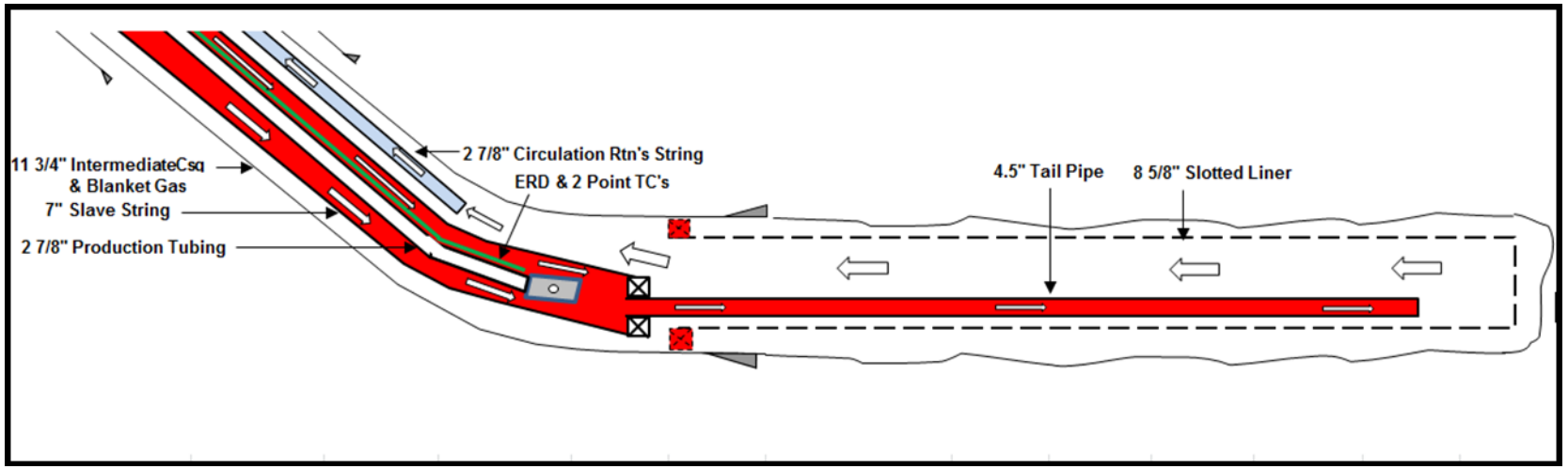


Typical Well Completions – Pad 824 (DSAGD)

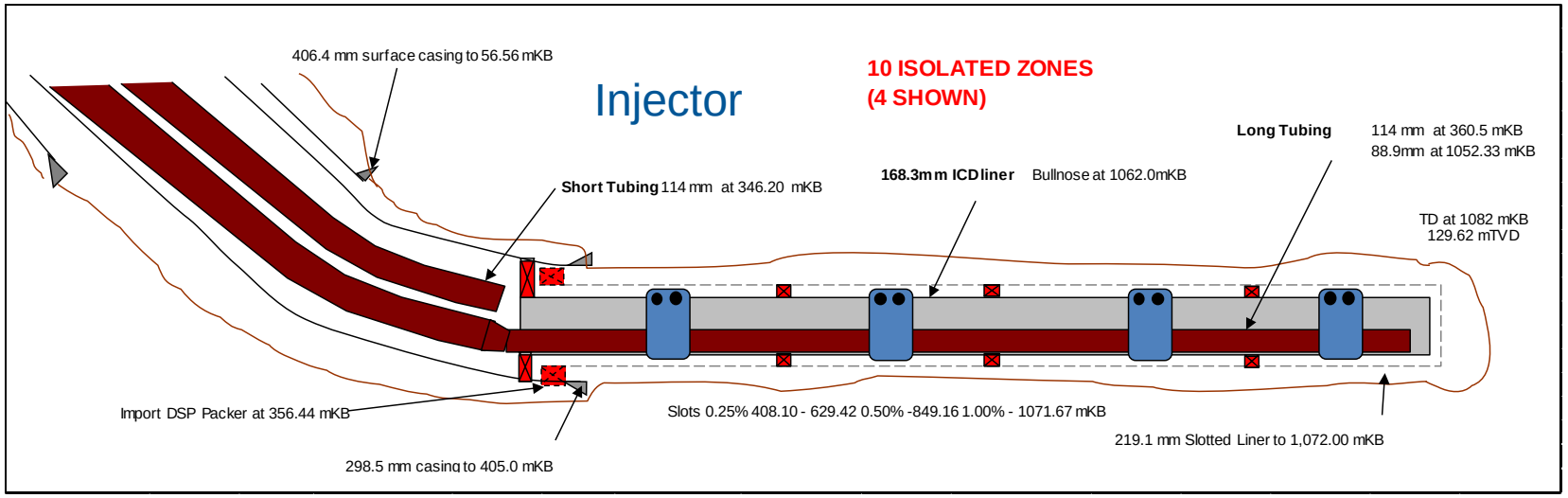


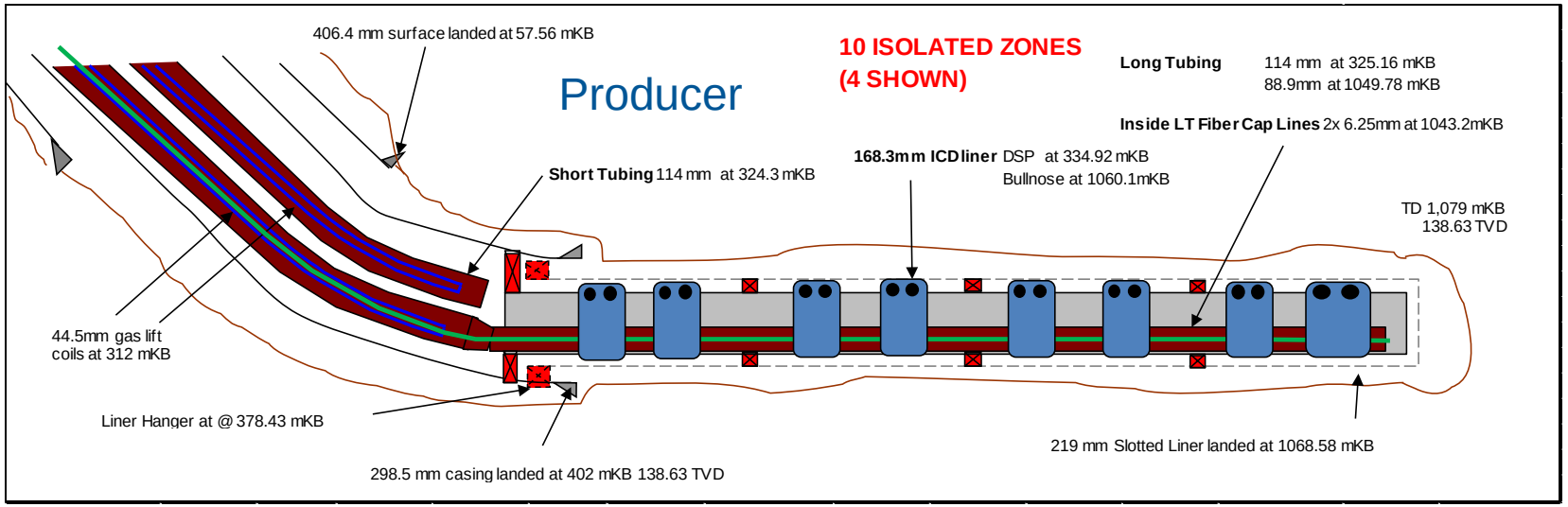
Typical Well Completions – Pad 824 (DSAGD)

- Direct to SAGD (DSAGD) – well design that avoids the need for conversion from circulation completion to a SAGD (ESP) completion
- DSAGD combines initial completion stage with Mechanical Lift (ML) conversion stage
- Allows flexibility to return to circulation if well is not quite ready, and no down time during conversion
- No additional completions are needed for ML conversion as pump is already down hole
- Steaming past the pump has not appeared to affect run life



Typical Well Completions – Flow Control Devices





Typical completion diagram for producer and injector in isolation

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Well Downhole Instrumentation

- Phase 1 (25 well pairs):
  - Temperature optic fibre in 4 producers have been replaced and are functional today (A5, B2, C1, and C2).
- Phase 2 (14 well pairs):
  - Temperature fibre optic installed in G6P;
  - P/T gauge installed in G6I.
- Phase 3 (7 well pairs):
  - No instrumentation.
- Phase 4 (10 well pairs):
  - No instrumentation except temperature fibre optics in OO3 I & P;
  - Temperature fibre optic installed in NN1P.
- Phase 5A (6 well pairs):
  - Pressure - bubble tube to the toe in every producer;
  - Two producers equipped with 6 point thermocouple bundle to the toe (QQ5, NN5).
- Phase 5B-1 (6 well pairs):
  - Pressure - bubble tube to the toe in every producer except OO5;
  - All producers equipped with 6 point thermocouple bundle to the toe except OO5 and OO9 which have temperature fibre optic.

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Well Downhole Instrumentation

- Phase 5B-2 (10 well pairs):
  - Pressure – bubble tube to the toe in every producer;
  - All producers equipped with 6 point thermocouple bundle to the toe.
- Phase 5D&F (18 well pairs):
  - Pressure – bubble tube to the toe in every producer except OO well pairs which have pressure gauges;
  - All producers equipped with fibre optic to the toe, except OO10.
- Pad 824 (2 well pairs):
  - All producers equipped with ERD (P/T) and 2 point thermocouple on pump.

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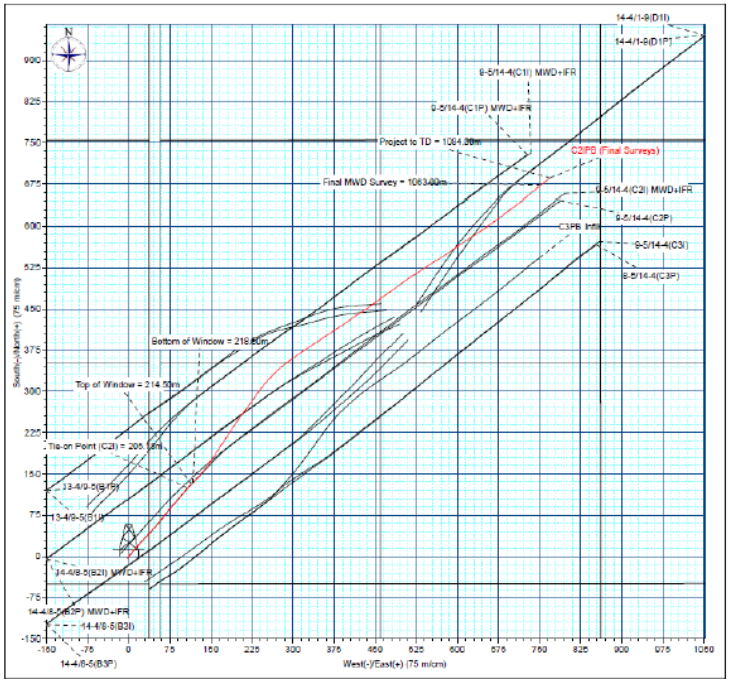
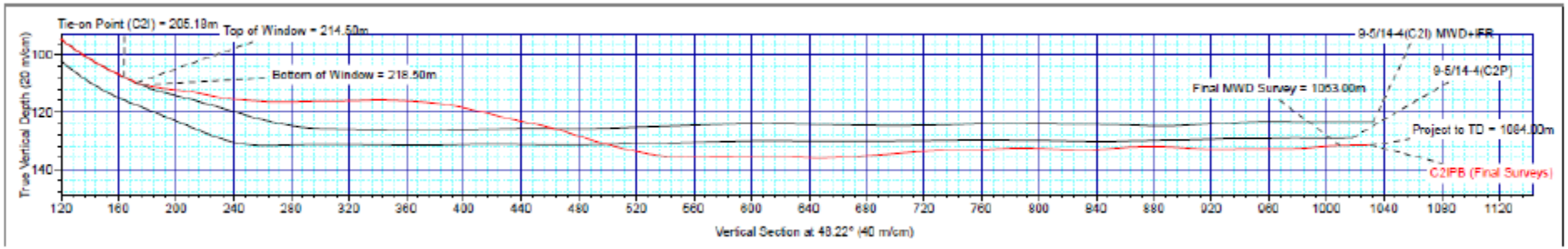
Artificial Lift

- All existing SAGD production wells designed for gas lift:
  - Low cost completion;
  - Recover gas;
  - No downhole moving parts.
- Producing wells with downhole pumps:
  - F1P, ESP since February 2009, current pump installed March 2011.
  - OO3P, ESP since October 2009, current pump installed March 2012.
  - 824P1/P2, DSAGD completion installed in May 2015. Production since Feb 2016 (current pumps).

New Re-Drill/Sidetrack

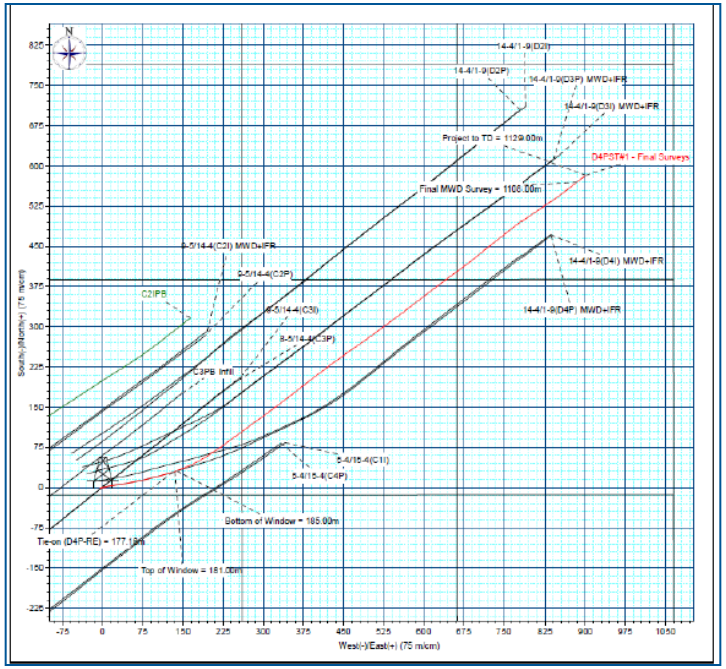
- C2IPB Infill
  - C2P was not producing since 2011.
  - Abandoned injector and drilled C2IPB off the C2I intermediate casing.
  - Infill drilled ~ 40-50 m away laterally between C2P and C3P
  - Drilled at the same depth as the original wellbore
    - Gained ~ 3m of cellar oil over 300 m of the well

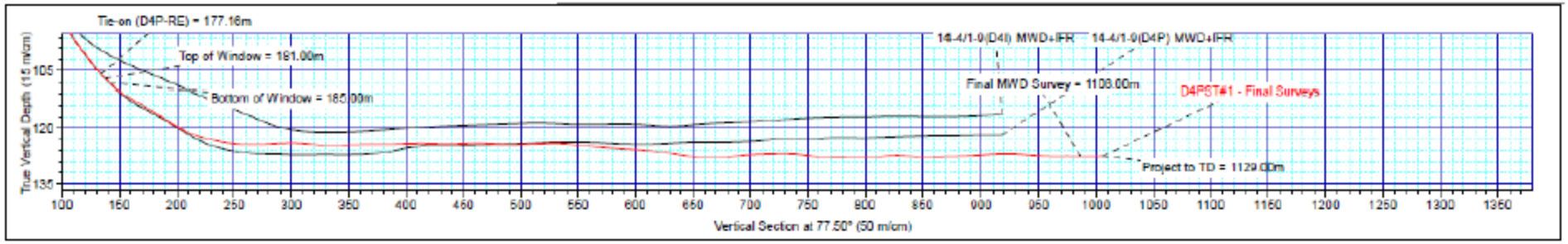




New Re-Drill/Sidetrack

- D4PB Infill
  - D4P was producing at very low oil rates.
  - Abandoned original wellbore and drilled infill off the original wellbore intermediate casing
  - Infill drilled ~ 50 m away laterally between D3P and D4P
  - Drilled at the same depth as the original wellbore
    - Gained ~ 2m of cellar oil over 300 m of the well





Key Learnings: Wellbore Integrity Management

- ***Wellbore integrity management*** is a high priority focused on wellbore containment over a wells' full life cycle:
  - **Flow Control Devices** installation to control steam coning, avoid liner failures (NN12 and OO14);
  - **Subcool strategy**: operate wells above subcool limit to control steam coning;
  - **Monitoring and Surveillance;**
  - **Wellbore thermal shock mitigation** for start-up after wild fires (i.e. B5);
  - **Erosion monitoring program;**
  - **Monitoring and repair of SCVFs:**
    - Regular monitoring of pressure, rate and/or bubbles & H_2S concentration (annually for non-serious SCVFs, monthly – quarterly for serious SCVFs);
    - Gas migration rates continue to decline indicating remediation work may have been successful;
    - Innovative repair techniques (i.e. SMART tool).

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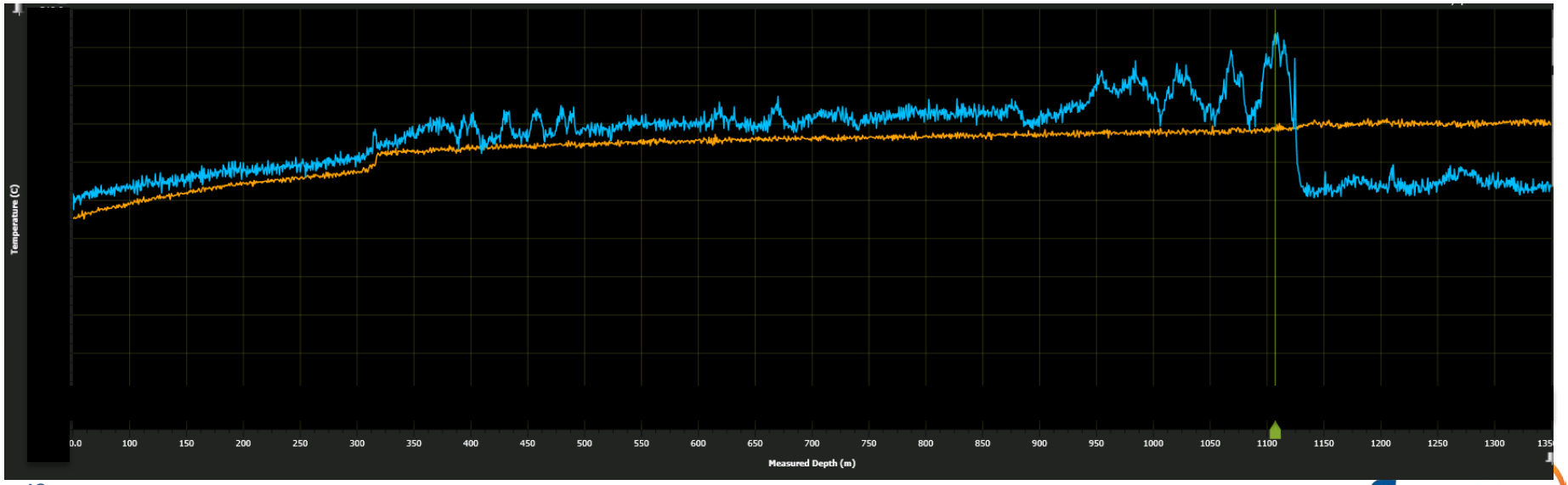
Key Learnings: Well Enhancement Repairs

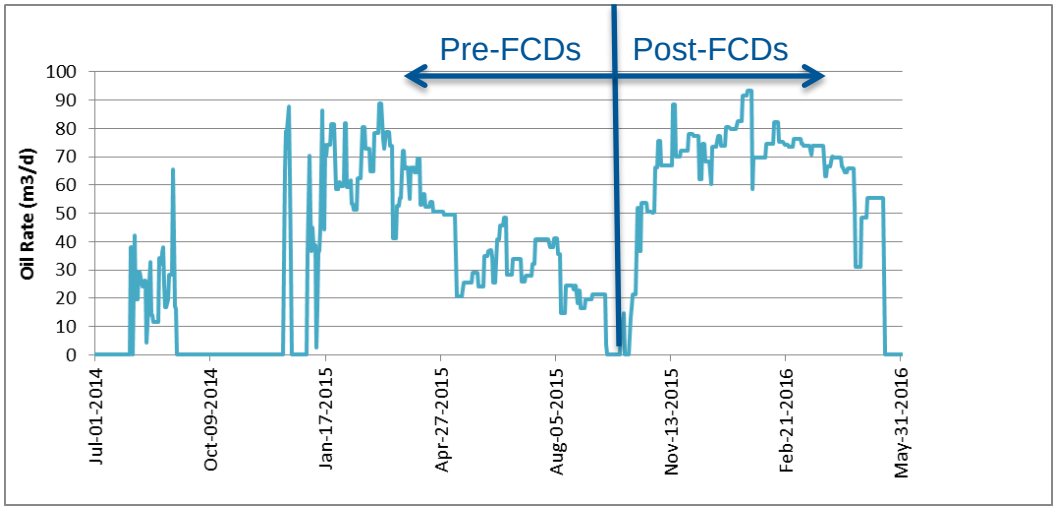
- ***Flow Control Devices(FCDs):***
  - Used to repair steam break through condition, achieve higher and consistent flow rate, reduce risk of future new steam break through and potential liner failure;
  - FCD completions utilized in new, mature and sidetracked wells using various vendor devices:
    - Early results look promising:
      - Example of well limited due to hot spots Pre-FCD's (blue) now capable of full drawdown for increased peak production (orange).



Flow Control Device Implementations

Wide use of flow control devices (FCDs)

- 15 producers, 2 injectors, and 1 sidetrack now have FCDs installed at MacKay River;
- 2 new producer wells recompleted with FCDs since Sept 2015 (NN12, OO14);
- Improving design and implementation through field experience;
- Suncor field experience enhanced through working with industry to develop FCDs learnings in the field and enhancing performance predictions evolving simulation efforts.



Flow Control Device Implementations

Well	Status	Start of SAGD	Start of Production with Flow Control	FCD Well Type
H2	SAGD	Apr-2010	Oct-2014	Producer ICDs
OO4	SAGD	Jun-2012	Jan-2015	Producer ICDs
OO12	SAGD	Jan-2015	Jan-2015	Inj OCDs+ Prod ICDs
NN15	SAGD	Feb-2015	Feb-2015	Inj OCDs+ Prod ICDs
OO10	SAGD	Aug-2014	Apr-2015	Producer ICDs
OO6	SAGD	Jun-2012	Apr-2015	Producer ICDs
NN1	SAGD	Feb-2009	Apr-2015	Producer ICDs
OO5	SAGD	Jun-2012	Apr-2015	Producer ICDs
NN3	SAGD	Nov-2011	Jun-2015	Producer ICDs
F5	SAGD	Jan-2008	Jun-2015	Producer ICDs
OO15	SAGD	Aug-2014	Jun-2015	Producer ICDs
E4	SAGD	May-2006	Jul-2015	Producer ICDs
NN11	SAGD	Jan-2015	Jul-2015	Producer ICDs
NN12	SAGD	Jan-2015	Oct-2015	Producer ICDs
OO14	SAGD	Sep-2014	Oct-2015	Producer ICDs

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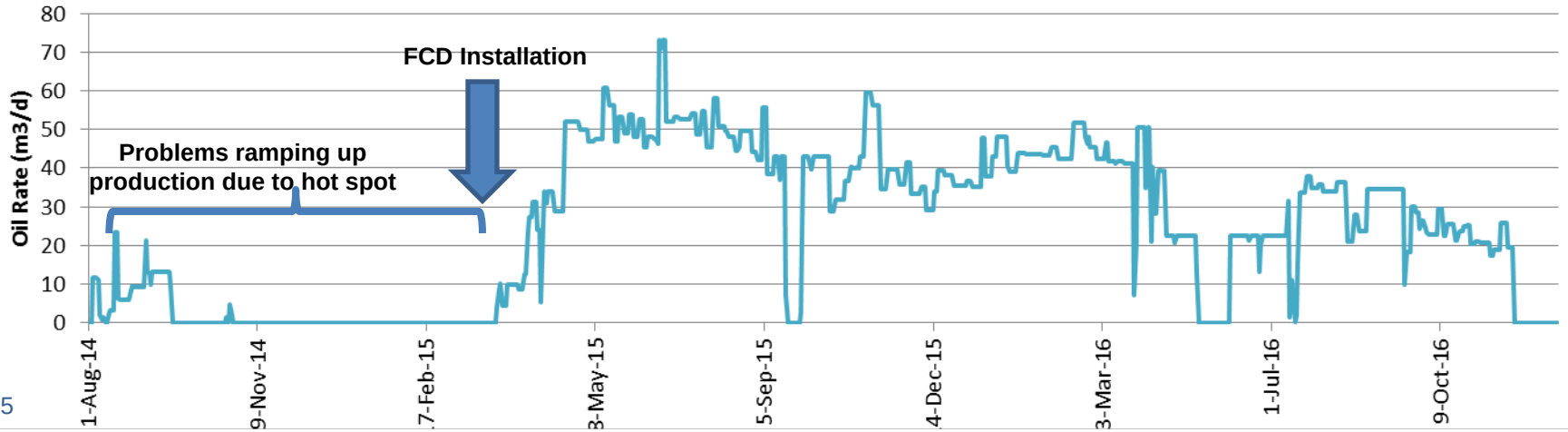
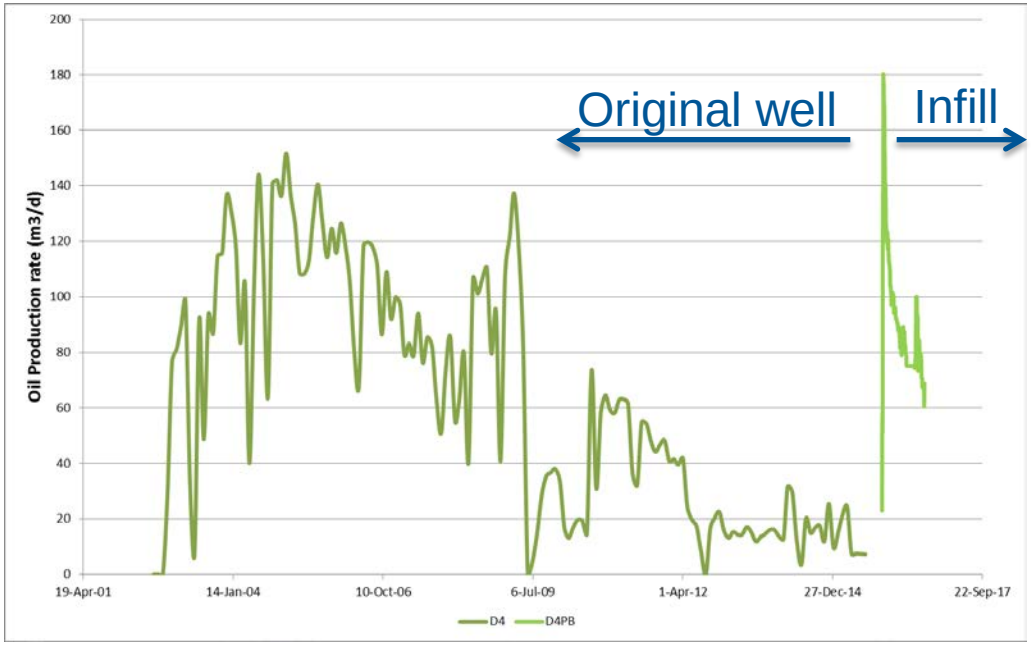
Flow Control Device Implementations

- Producer FCD Retrofit Unsuccessful
  - Well experienced steam coning which limited production shortly after conversion
  - Various alternative operating strategies were attempted unsuccessfully
  - Flow control installed after about 8 months
    - Included a long string to allow circulation inside of FCD string
  - Quick ramp-up after FCD workover
  - Subsequently, production rates dropped faster than anticipated as steam production remained problematic
    - May be due to limited reservoir deliverability
    - FCD with more effective steam-limiting characteristics may be required for such cases

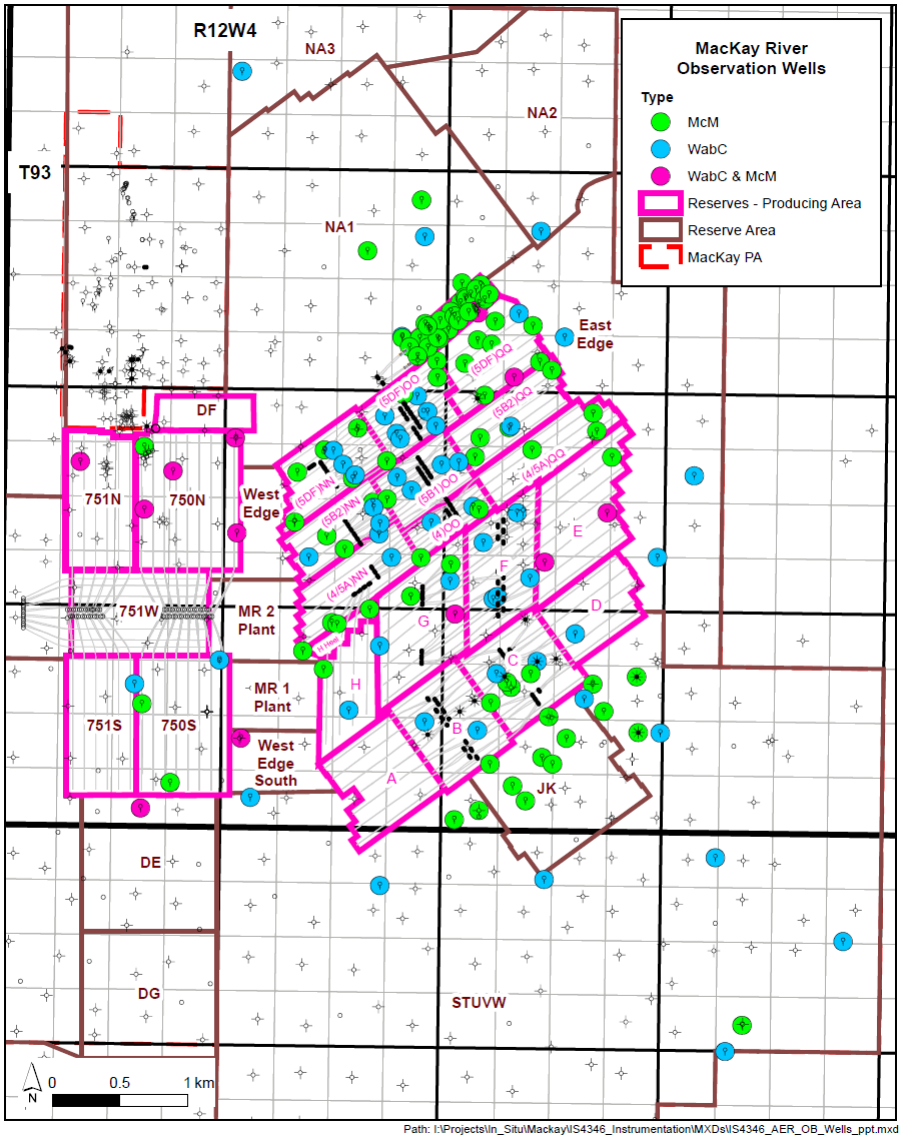


Key Learnings: Infill and Sidetracked wells

- ***Infill and Sidetracked Wells:***
  - Drilled 3 infill wells, sidetracking from original wellbore intermediate casing (C2IPB, C3PB, D4PB) and 4 sidetracks (G7PB, G6, E1 and NN6):
    - Drilling operation learnings;
    - Sand control installation (WWS, PPS, Meshflux screens);
    - Start-up procedures (steam flushes, steam circulation & bullheading);
    - Performance Evaluation (reservoir, wellbore hydraulics, operations).
  - Increased production and reserves by drilling into cellar oil accessing unswept reservoir.



Observation Wells



Observation wells	
87	McM
52	Wab C
15	Wab C & McM
154	**Total**

Observation Well Overview

- Total of 154 licensed observation wells at MacKay River;
- Observation wells at MacKay River serve three main purposes:
  1. Reservoir optimization (steam chamber monitoring):
     - 40 wells with fibre optic cable from surface to TD:
       - 7 wells with fibre optic cable and pressure sensors.
     - 43 wells with thermocouple bundles and pressure sensors.
  2. Wabiskaw C pressure monitoring:
     - 65 wells with a single pressure / temperature sensor.
  3. Subsurface Monitoring (outside of producing area):
     - 5 wells with thermocouple bundles and pressure sensors;
     - 2 wells with a single pressure / temperature sensor;
     - 5 piezometer wells.
- Current observation well design incorporates thermocouple measurement as this provides sufficient resolution for steam chamber monitoring and is preferred for remote well locations.

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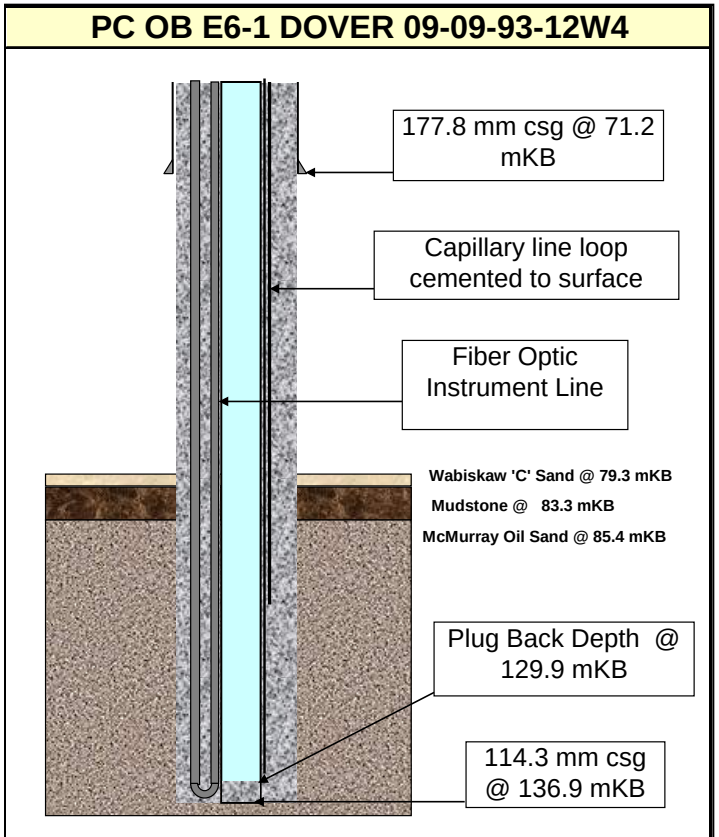
Typical Observation Well Instrumentation – Question #6

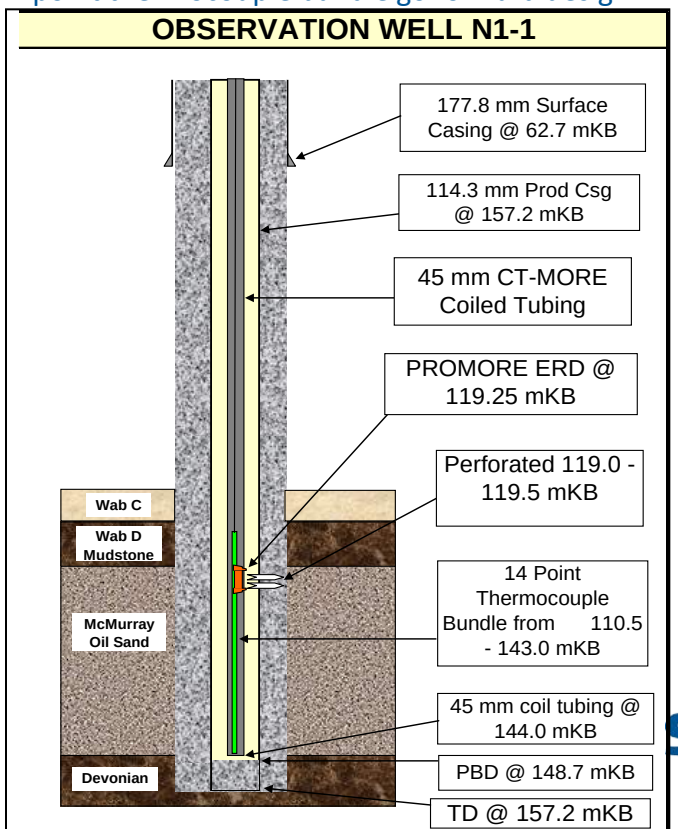
McMurray Observation Well (Type 1):

- Capillary line loop cemented outside casing
- Fibre optic cable pumped into capillary line loop to provide temperature profile along entire vertical well depth
- Allows for close monitoring of steam chamber development
- There are no reliability concerns with the Type 1 observation well temperature data



McMurray Observation Well (Type 2):

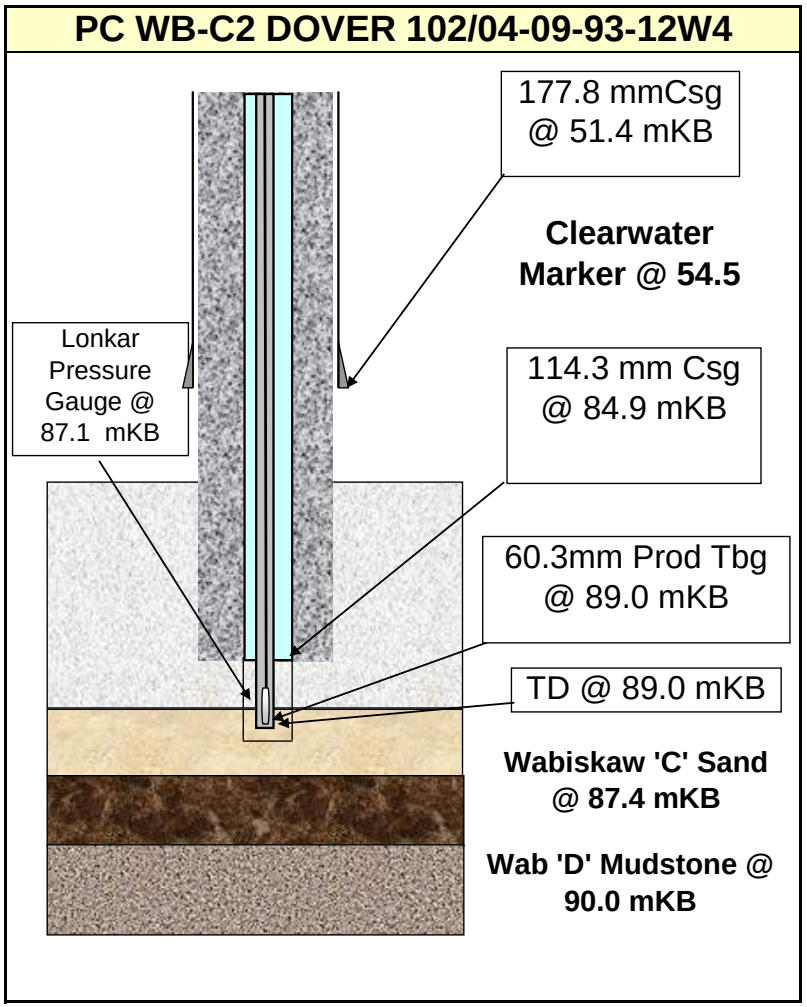
- Coiled tubing instrument string containing 14 thermocouples and 1 P/T gauge run inside 114 mm intermediate casing
- Perforated near the top of the McMurray oil sands zone
- Pressure / temp gauge positioned at MPP
- 14 point thermocouple bundle collects temperature data across the McMurray
- 24 point thermocouple bundle go forward design



Typical Observation Well Design

Wabiskaw C Observation Well:

- Open hole into Wabiskaw C sand;
- Wellbore does not penetrate Wabiskaw D mudstone or McMurray sand;
- Pressure / temp gauge landed inside tubing;
- WBC-56 drilled and tested;
- WBC-40 abandoned in Feb 2016;
- WBC-29 after the cleaning, instrumentation readings have been consistent with the expected Wab-C P & T;
- WBC-41 lost communication in 2016, vendor scheduled to inspect and remediate the well in September 2016;
  - WBC-41 had a downhole gauge replacement completed on September 22. Reliable WabC data has been observed since then.
- WBC-39 high-T well, down since March 2016, requiring downhole intervention based on July 2016 vendor inspection.
  - WBC-39 is in the planning stage for a downhole gauge replacement. The scope of work is similar to the workover done on WBC-41.



MacKay River Performance Presentation

SAGD Scheme Performance

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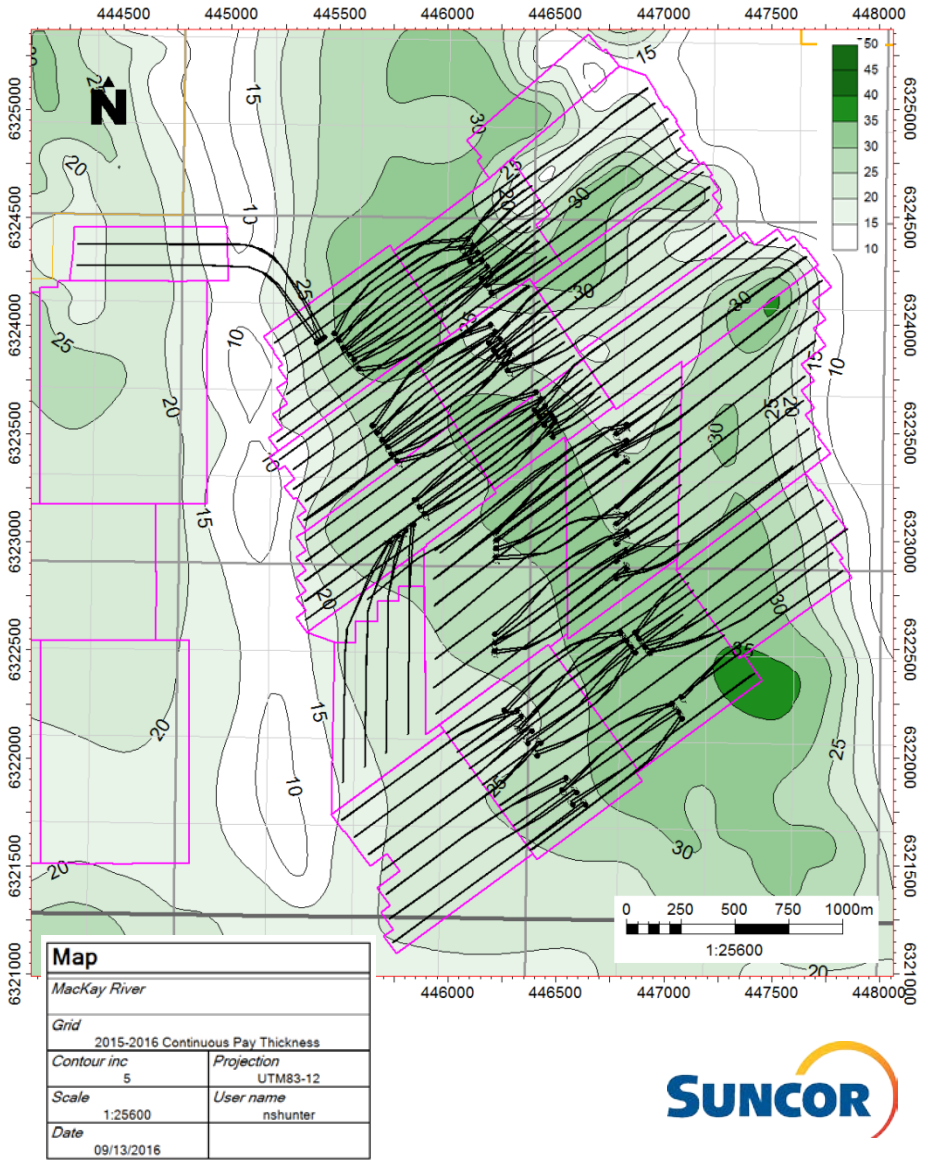
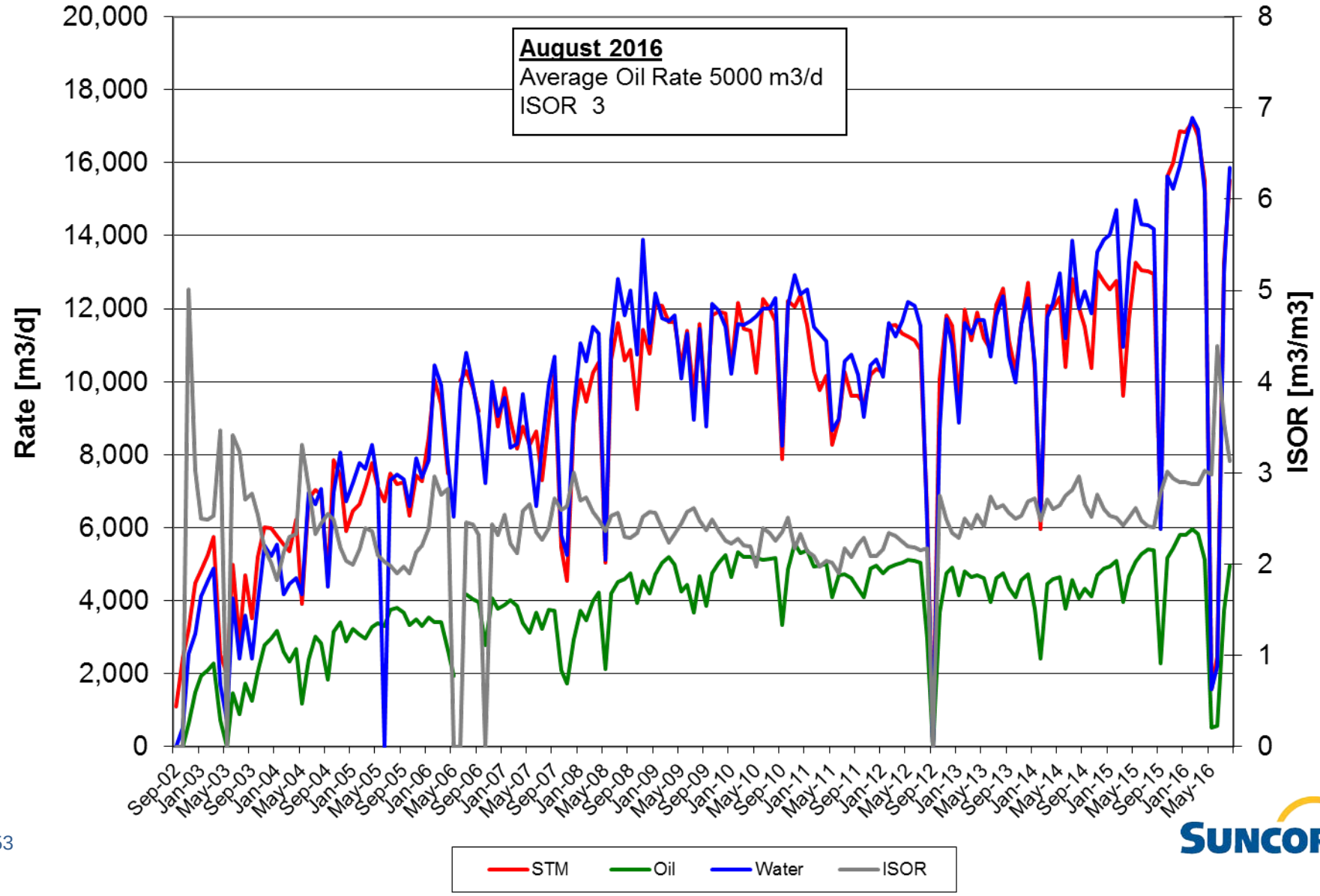
Summary of Operating Wells

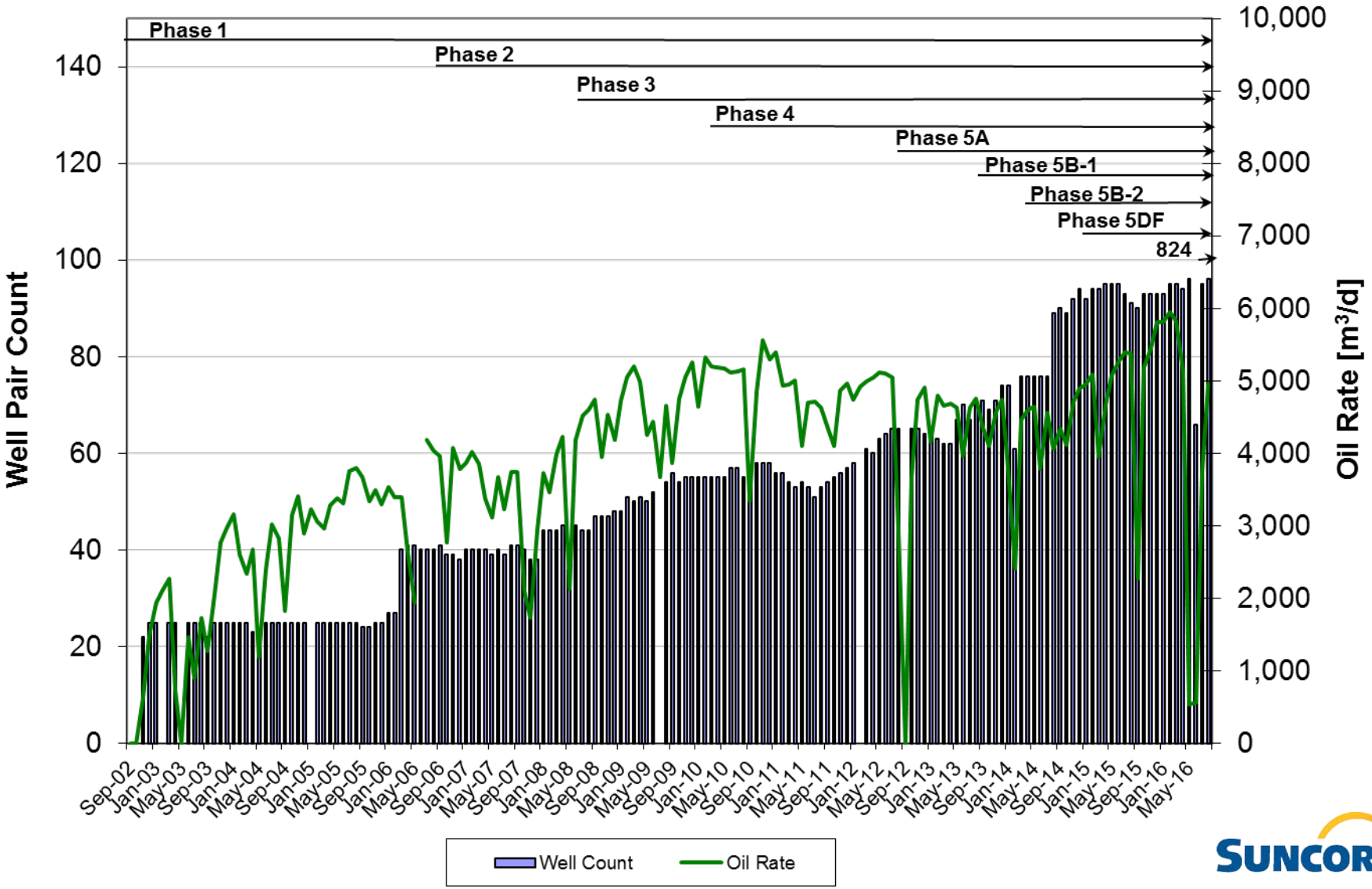
Pad	Pattern	Phase	# Well pairs	First steam to Pad
20	A	1	7	Sept 2002
	C		6	
21	B		7	
	D		5	
22	E	2	7	Jan 2006
	G		7	
23	F	3	7	Sept 2007
24	OO	4	3	Oct 2008 - Apr 2009
		5B-1	6	Feb 2012
		5DF	6	May 2014
	H	4	4	Feb 2009 - Jun 2010
25	QQ	4	2	Nov 2008
		5A	2	Jul 2011
		5B-2	5	Jan - May 2013
		5DF	6	June 2014
	NN	4	1	Dec 2008
		5A	4	Jun - Jul 2011
		5B-2	5	Jan - Feb 2013
		5DF	6	June 2014
824			2	Oct 2015



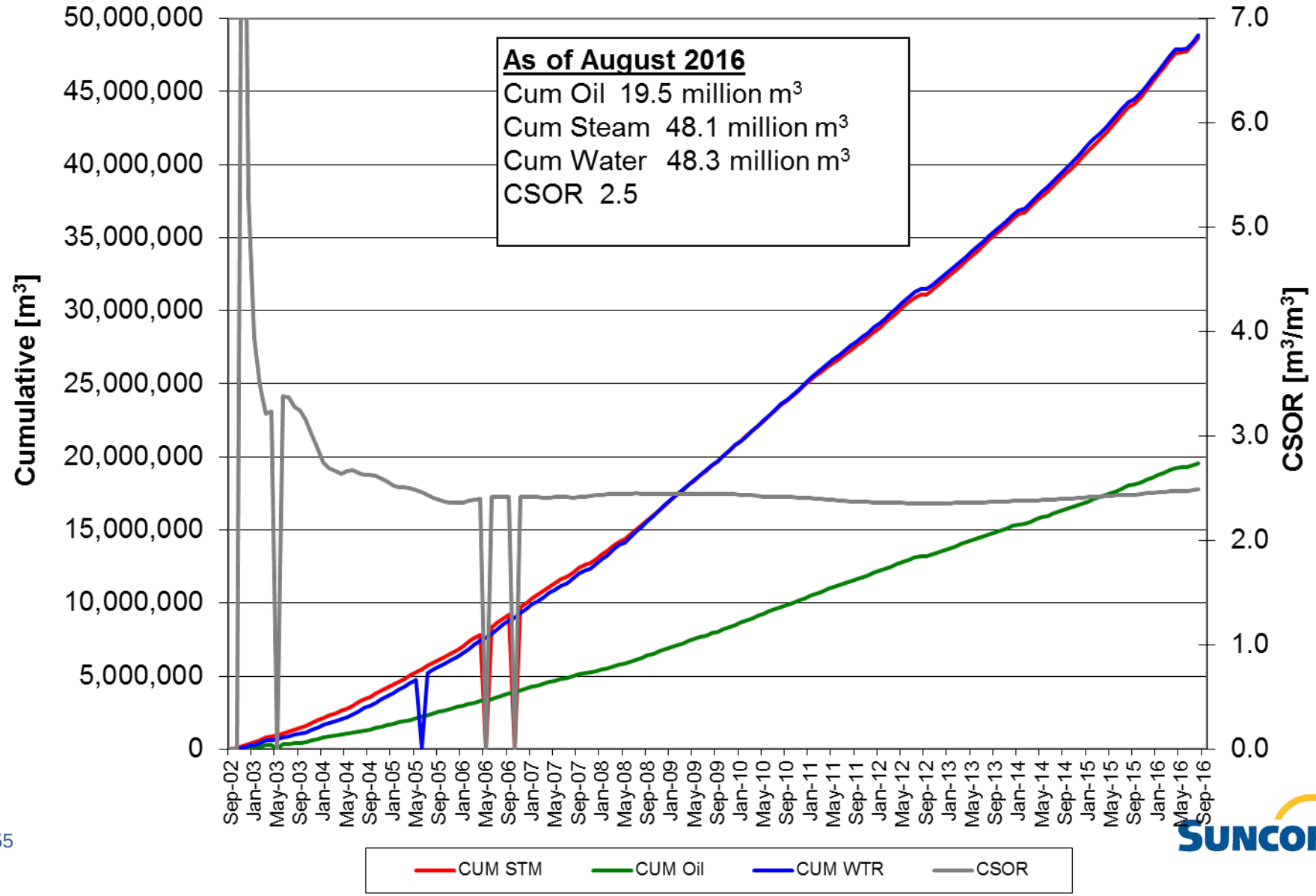
Fluid Rates


August 2016
Average Oil Rate 5000 m3/d
ISOR 3
Rate [m3/d]
ISOR [m3/m3]
20,000
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
8
7
6
5
4
3
2
1
0
Sep-02 Jan-03 May-03 Sep-03 Jan-04 May-04 Sep-04 Jan-05 May-05 Sep-05 Jan-06 May-06 Sep-06 Jan-07 May-07 Sep-07 Jan-08 May-08 Sep-08 Jan-09 May-09 Sep-09 Jan-10 May-10 Sep-10 Jan-11 May-11 Sep-11 Jan-12 May-12 Sep-12 Jan-13 May-13 Sep-13 Jan-14 May-14 Sep-14 Jan-15 May-15 Sep-15 Jan-16 May-16
STM
Oil
Water
ISOR

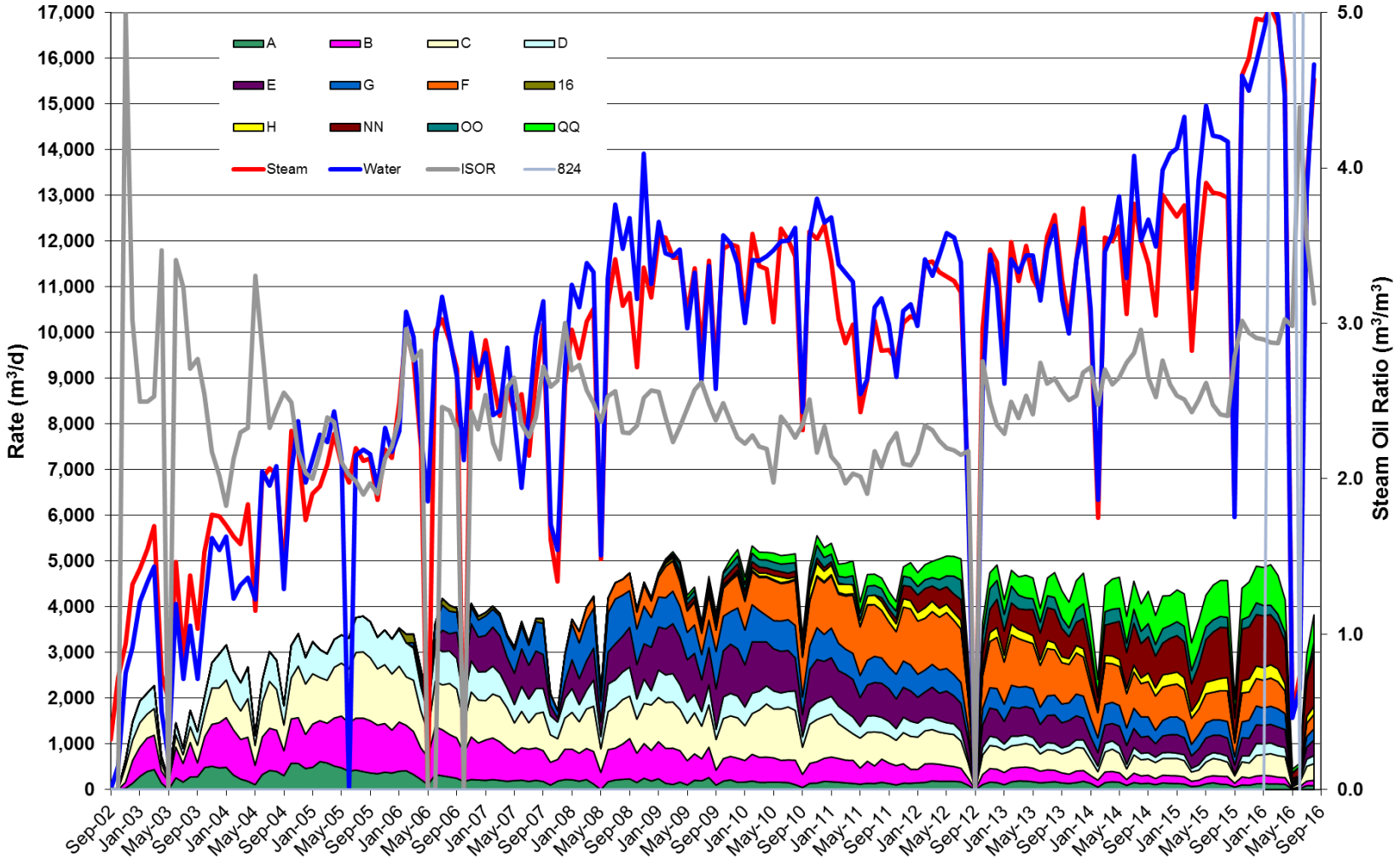
Producing Well Count



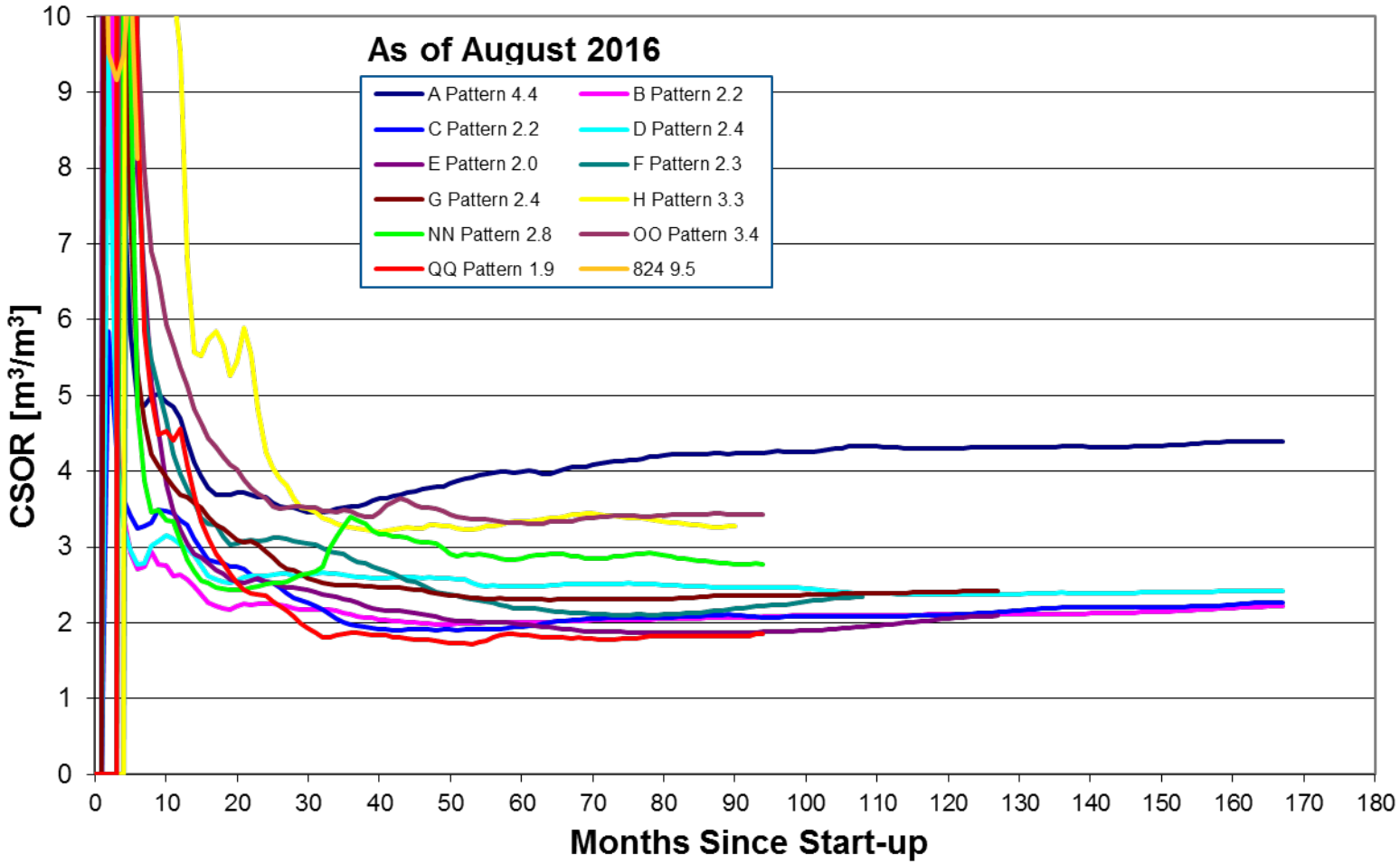
Cumulative Fluid Volumes



Average Oil Rate per Pattern



CSOR by Pattern



- QQ wells have the lowest CSOR
- NN wells have a mid range CSOR
- A Pattern has the highest CSOR

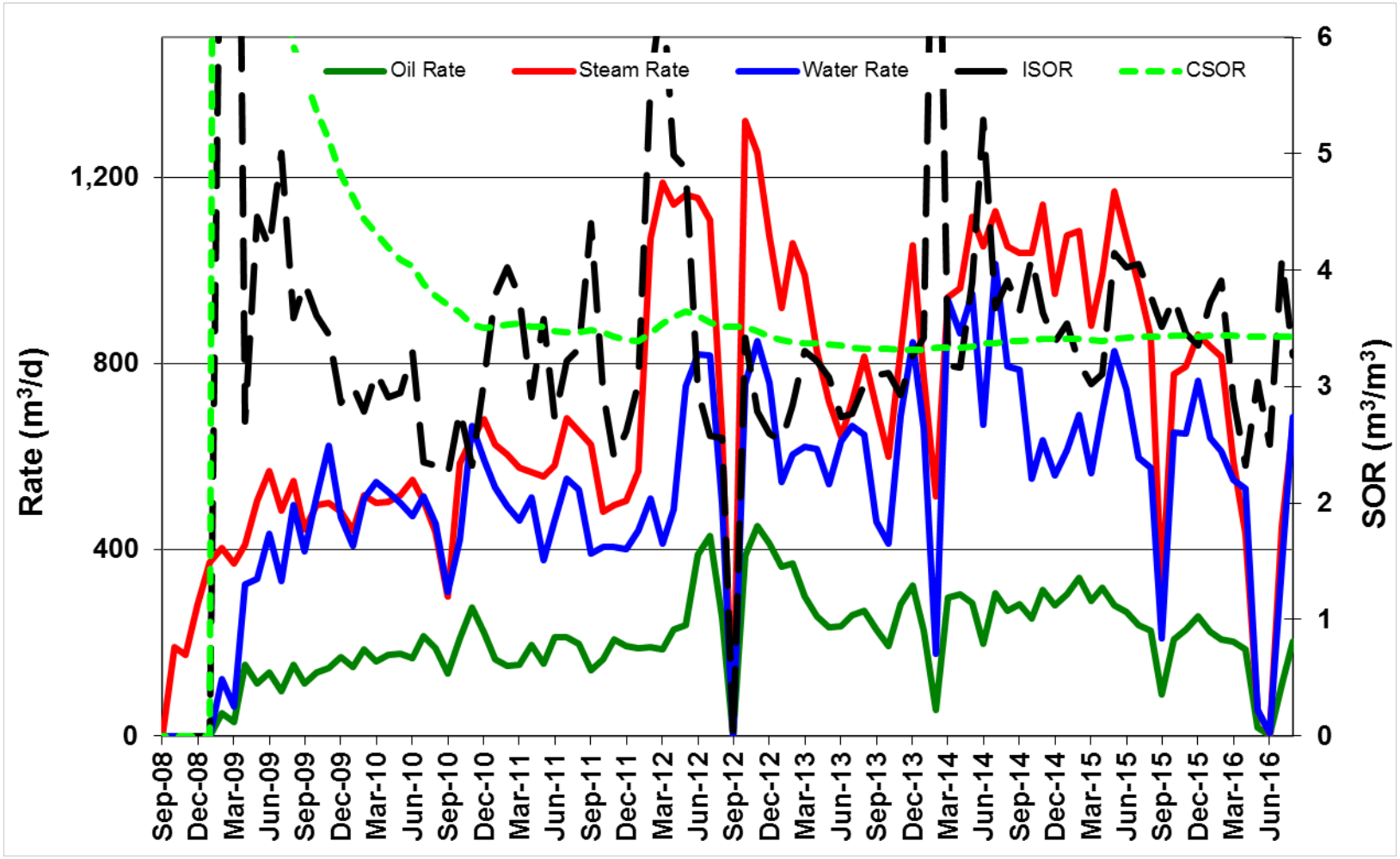
Performance Summary by Pattern

Pattern	OBIP [e³ m³]	Cum. Oil [e³ m³]	Recovery up to August 2016 [%]	CSOR [m³/m³]	ISOR (Aug. 2016) [m³/m³]	Ultimate Recovery [%]
Pattern A	**2,389**	1031	43.2	4.4	5.2	**47**
Pattern B	**3,319**	2664	80.3	2.2	7.7	**82**
Pattern C	**4,238**	3471	81.9	2.2	2.3	**89**
Pattern D	**2,741**	1923	70.2	2.4	3.2	**85**
Pattern E	**3,728**	2282	61.2	2.1	4.2	**70**
Pattern F	**3,616**	2342	64.8	2.4	5.0	**81**
Pattern G	**4,155**	1888	45.4	2.4	3.4	**54**
Pattern H	**1,756**	431	24.5	3.3	4.3	**47**
Pattern NN	**7,010**	1471	21.0	2.7	2.3	**58**
Pattern OO	**5,251**	784	14.9	3.2	2.9	**52**
Pattern QQ	**5,581**	1184	21.2	2.0	2.7	**55**
Pad 824	**684**	7	1	8.1	2.5	**60**
Total	**43,784**	**19,478**	**44**	**2.5**	**3.1**	**65**

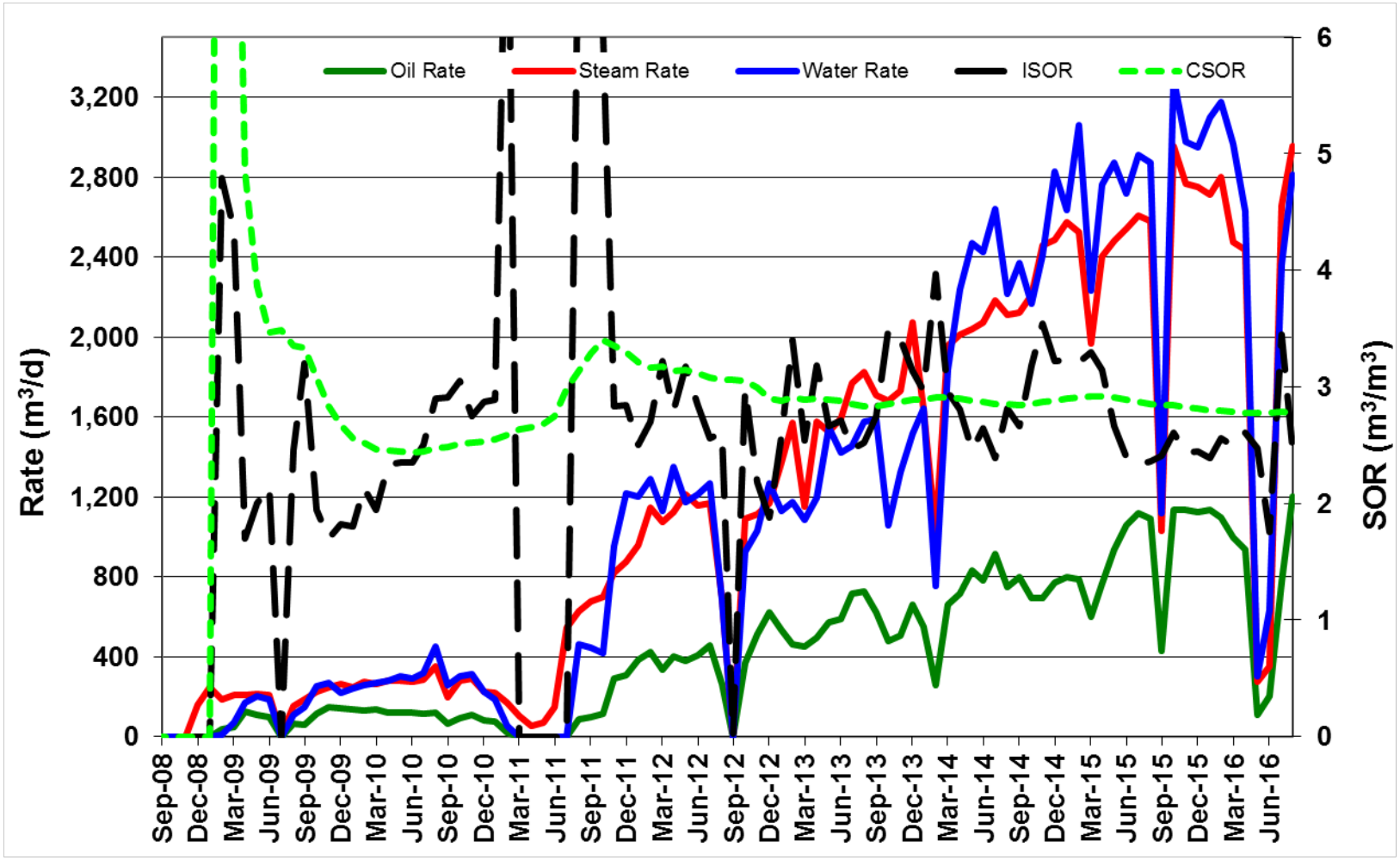
Pattern Examples Based on Recovery

	Pre-Fire ISOR [m^3/m^3]	CSOR [m^3/m^3]	Cum Oil [10^3m^3]	Peak Oil Rate [m^3/d/well pair]	Pre-Fire Oil Rate [m^3/d/well pair]	Comments
OO Pattern **Low Recovery**	2.4	3.2	784	13-150	8 - 54	• Very poor geology • 14.9 % recovery to date (ultimate RF: 52%) • Producing for 7 years
NN Pattern **Medium Recovery**	2.5	2.7	1,471	95-190	53 - 132	• Medium quality geology • 21 % recovery to date (ultimate RF: 58%) • Producing for 7 years
F Pattern **High Recovery**	3.9	2.3	2,342	151-277	45 - 105	• High quality geology • 64.8 % recovery to date (ultimate RF: 81%) • Producing for 8 years

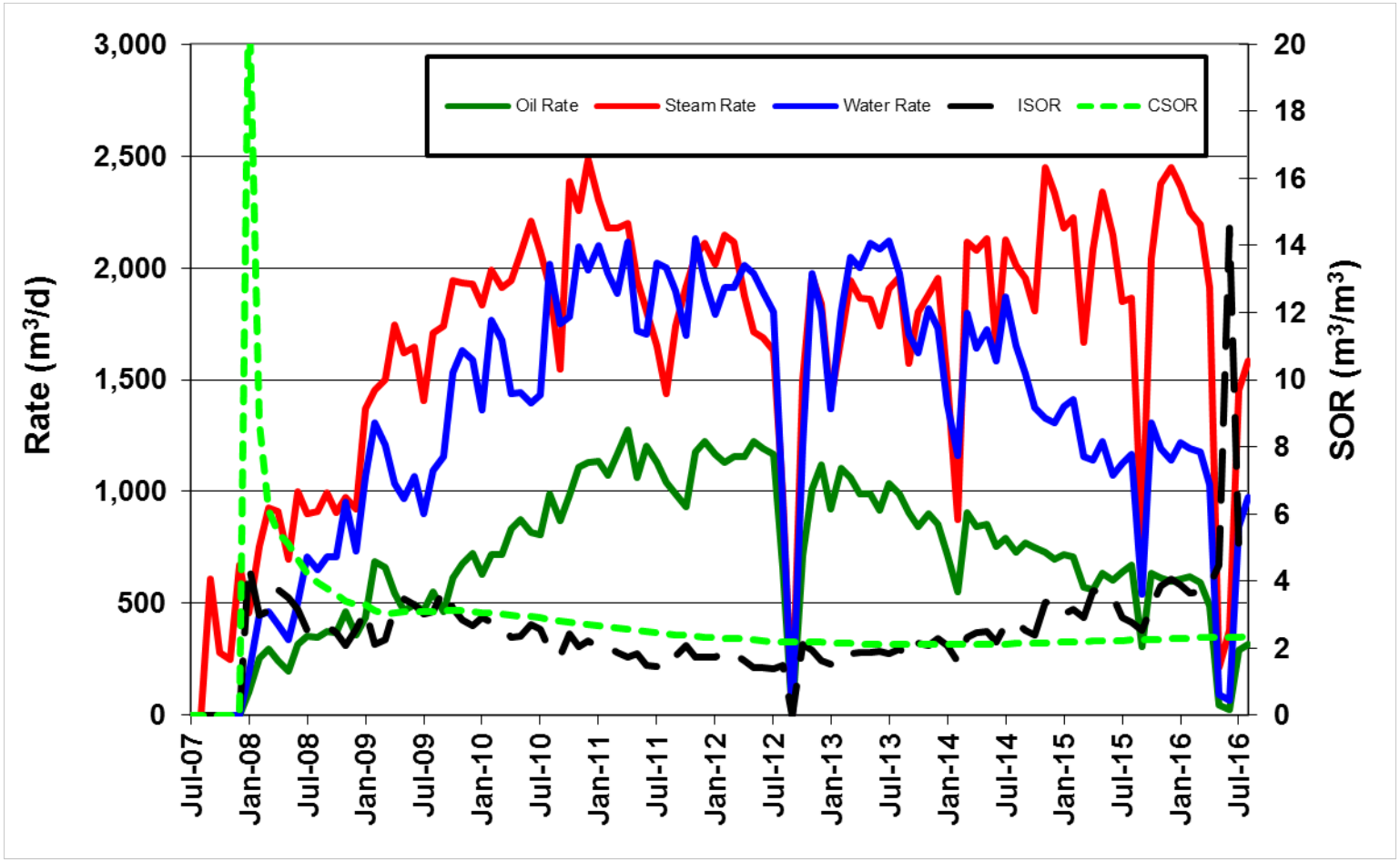
OO Pattern – Low Recovery



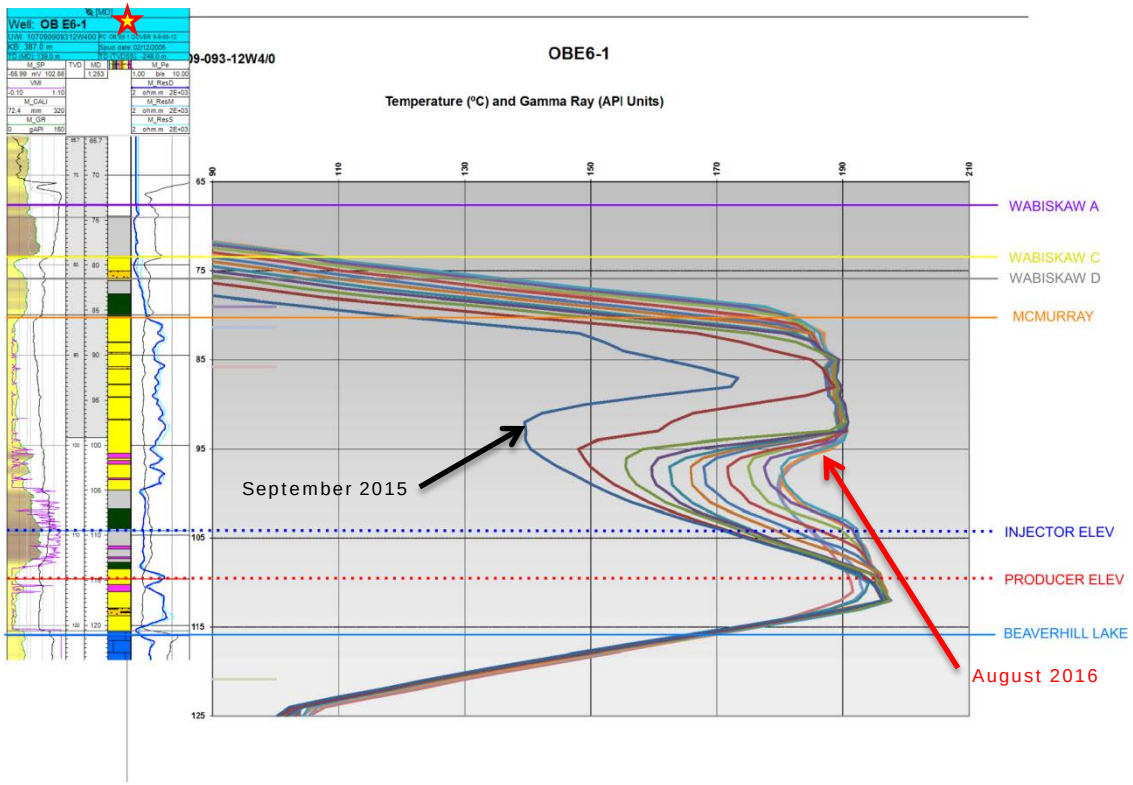
NN Pattern – Medium Recovery

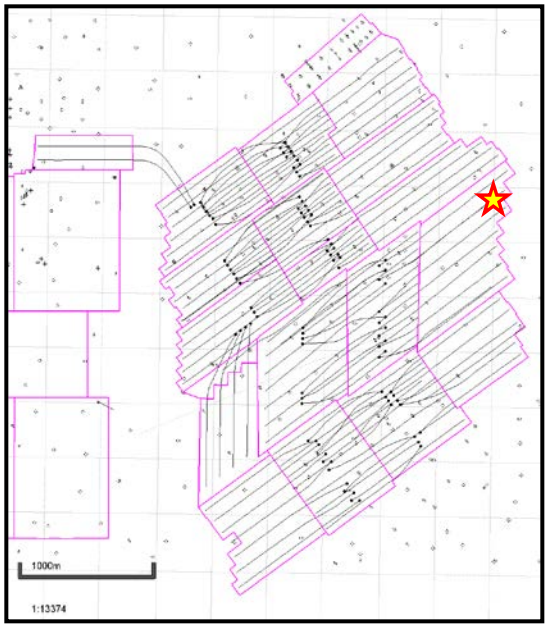


F Pattern – High Recovery



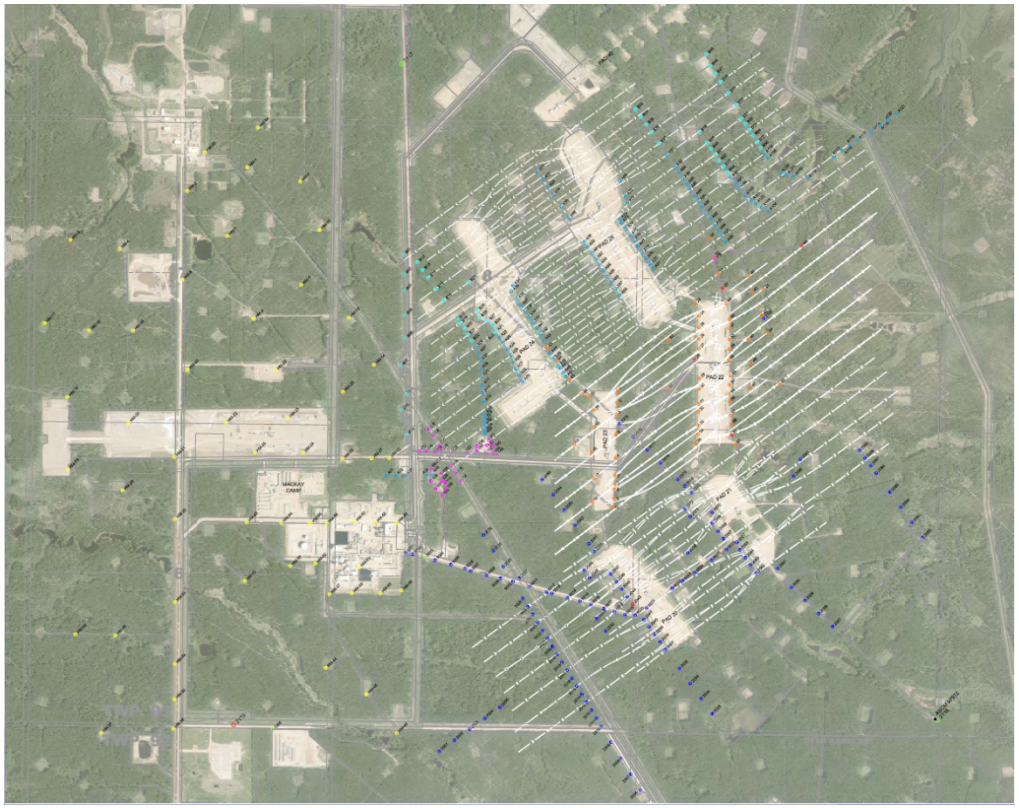
Steam Chamber Growth: OB E6-1 Observation Well





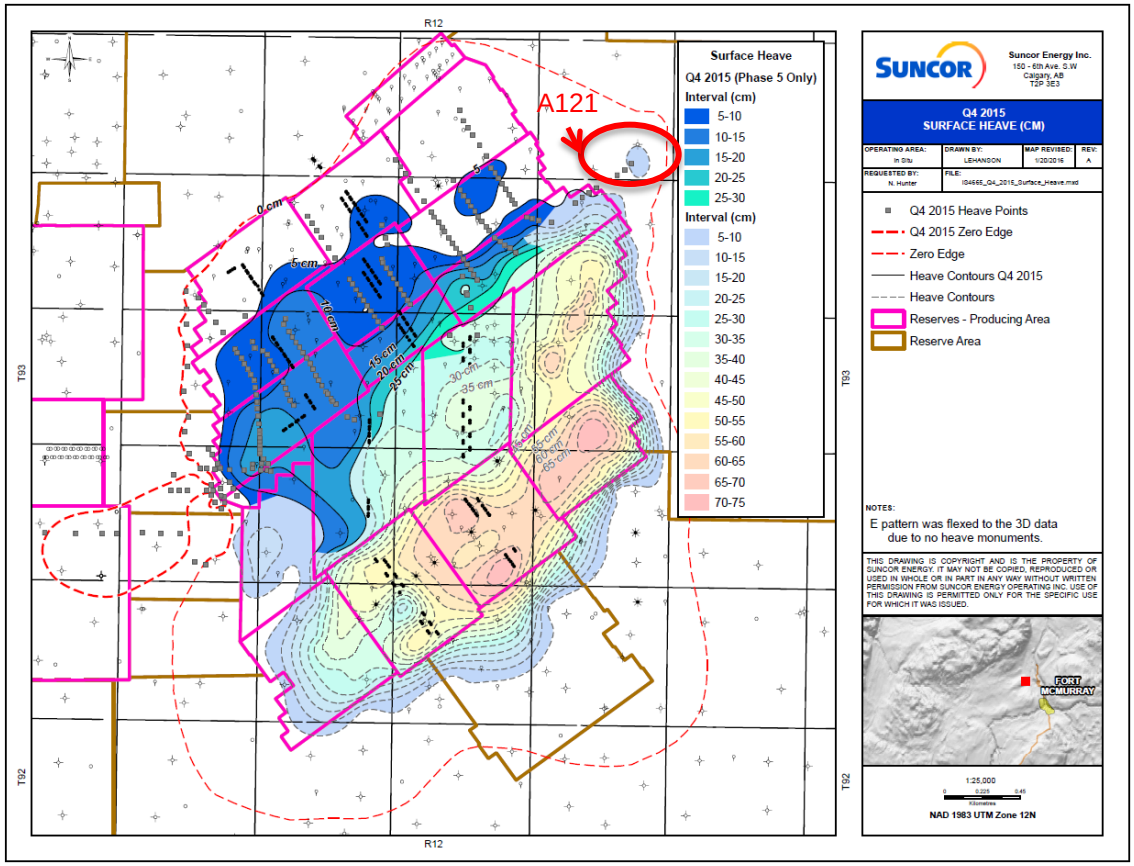
- After 9 years of stunted steam chamber growth, steam has been able to surpass geological layers of resistance:
  - OB E6-1 observation well shows that chamber can grow through IHS in certain areas;
  - Impediment restricted ~12m of chamber growth.

Steam Chamber Development: Surface Heave Monitoring



- 445 monuments exist over MacKay River for heave measurement and monitoring ;
- Installed 14 new monuments in 750/751 in 2016;
- Survey History:
  - 1st: Fall 2002;
  - 2nd: Dec 2006;
  - 3rd: Fall/Winter 2007/08;
  - 4th: Nov 2008;
  - 5th: Jan/Feb 2010;
  - 6th: Nov. 2010;
  - 7th: Dec. 2011;
  - 8th: Dec. 2012;
  - 9th: Oct 2013;
  - 10th: Oct 2014;
  - 11th: Oct 2015.

2D Surface Heave: Change from Baseline to October 2015



Survey strategy

- Heave surveys are performed at different frequencies depending on well vintage:
  - Oct 2015 heave survey for northern producing area (Ph 4 – Ph 5DF).

Heave monitoring application:

- Field performance monitoring coupled with seismic.

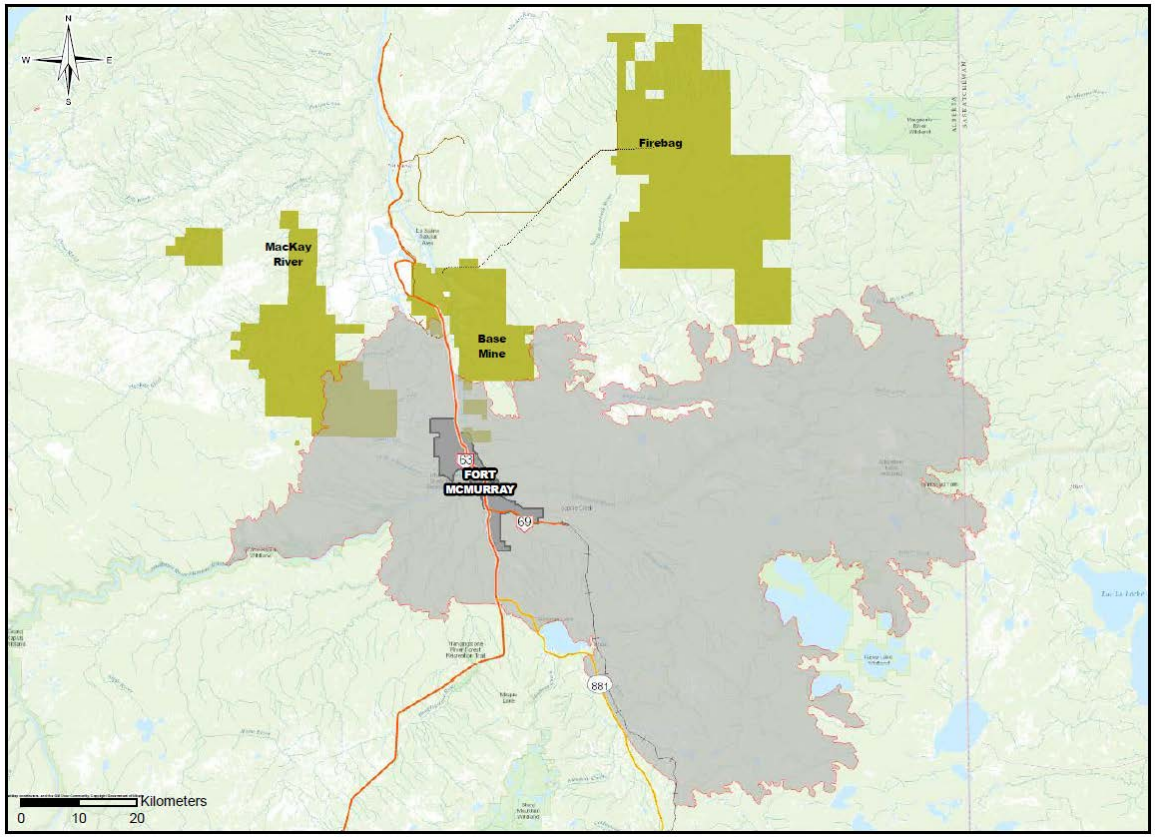
New heave monuments installed:

- Over 750/751;
- Next survey is planned for Q4 2016.

A121:

- Revisited A121 in Aug 2016 to validate elevation and monument integrity:
  - Readings are accurate:
    - Anomaly due to frost heave
    - Additional monuments installed for monitoring.

Key Learnings - Suncor Leases & Fire Extent

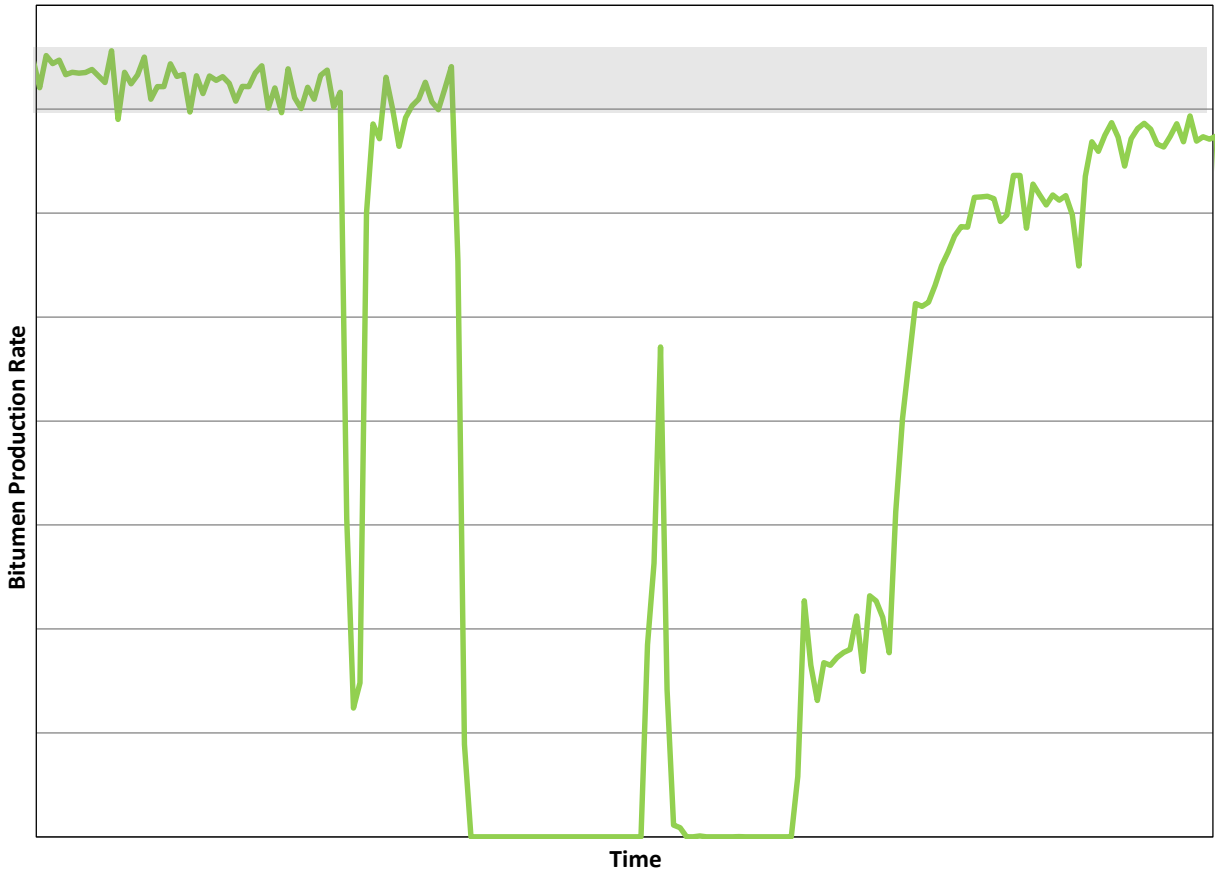


- Suncor safely evacuated over 10,000 people over 3 days:
  - Lodges and camps at all sites were used to house displaced individuals and families (~14,000 people);
  - Over 500 Suncor employees were directly involved in supporting the evacuation efforts;
  - Zero safety incidents and was zero asset damage related to the fire.
- MacKay River was shut down on May 3rd restarted on June 25th;
- There has been a focused effort since the restart, to understand the impact of an outage of this nature on our operations.

Key Learnings - Subsurface Learnings Following the 2016 Fort McMurray Fires

- MacKay River was returned to operation and ramped-up in a safe and efficient manner;
- Water cuts were significantly higher post-outage:
  - This behavior was expected based on past planned outages;
  - Past performance indicates that the duration of an outage is roughly equal to the recovery duration for bitumen production.
- Significant chamber pressure losses were seen during the outage, as a result of heat losses:
  - Temperature losses as a result of this contribute to the increased water cut seen at MacKay River:
    - Condensate from the collapsing steam chamber;
    - Density of fluids.

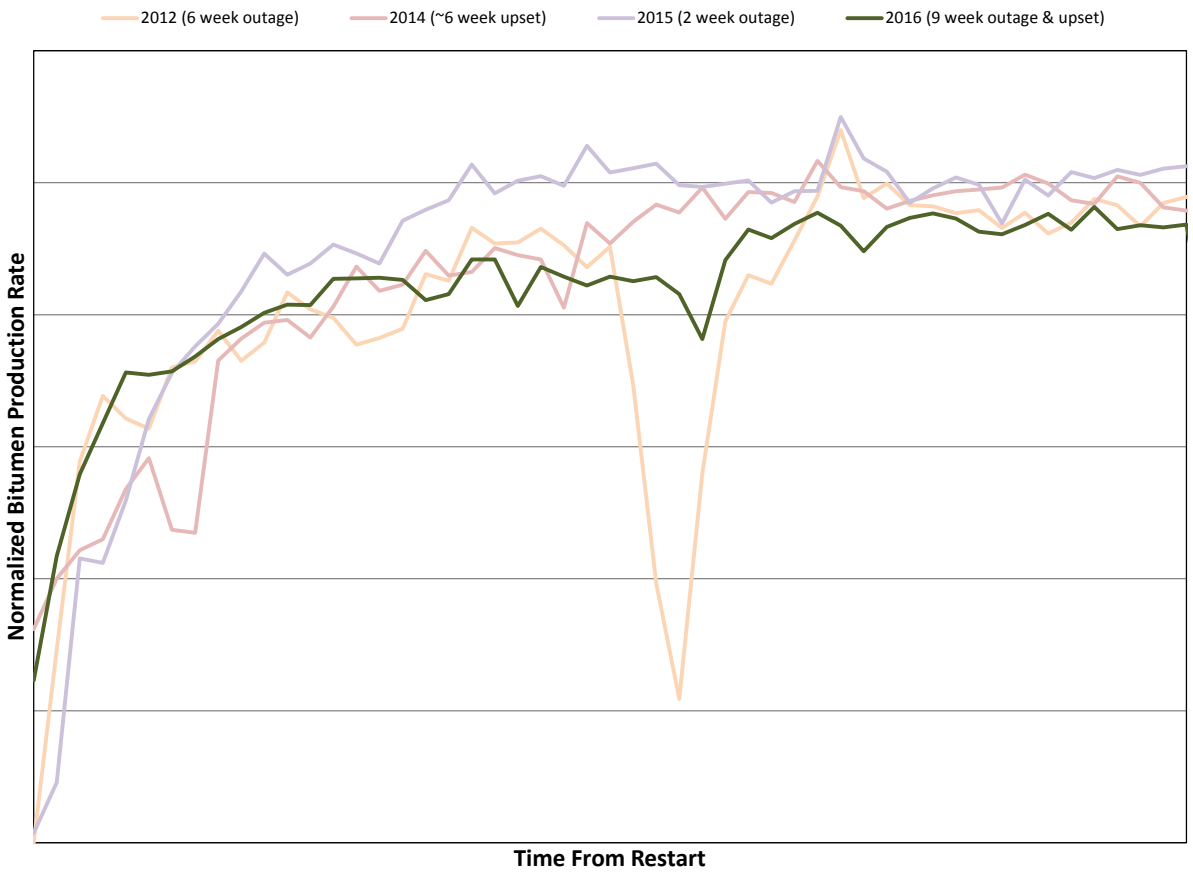
Key Learnings - MacKay River Production Recovery



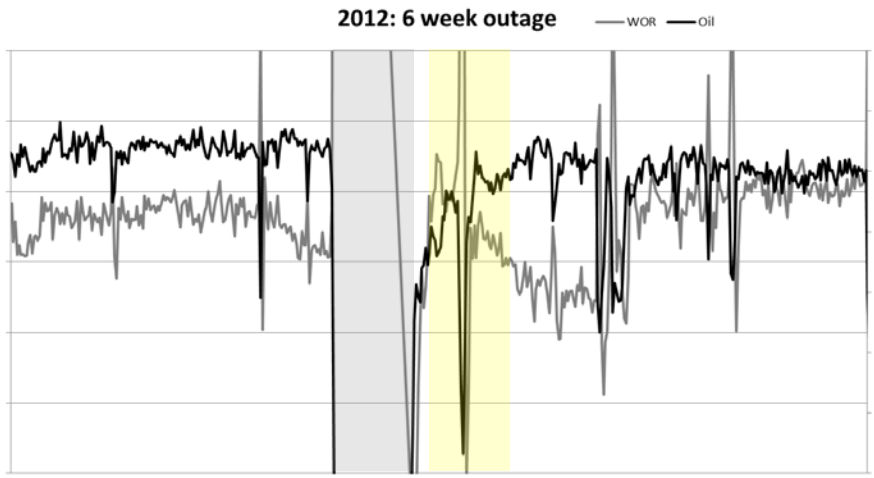
- Pre-outage average production ranged from 35-37 kbpd.;
- Since resuming normal operations, production has ramped up to between 33-35 kbpd;
  - Currently a couple percent below where production was prior to the fire;
  - Volumes are continuing to ramp up as wells return to pre-outage conditions.

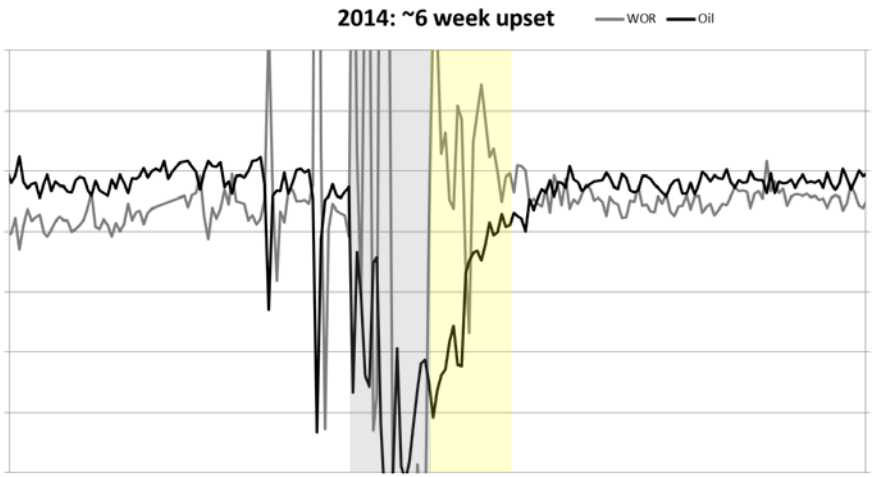
Key Learnings - MacKay River Current & Historical Recovery

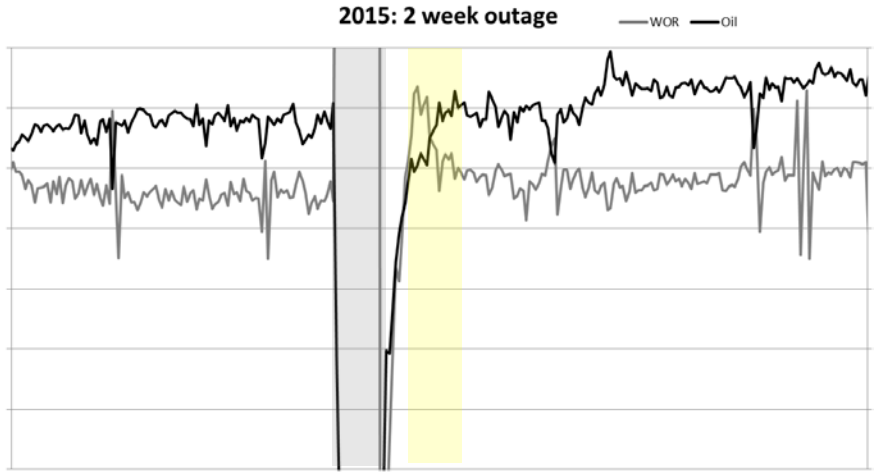
- Compared with past outages and upsets, and normalized for peak production expectations:
  - Recovery has been marginally slower than past ones to recover to full volumes;
  - The recovery, is related to high water cuts occurring following outages at MacKay River:
    - Due to condensate from the collapsing steam chamber & density of fluids.

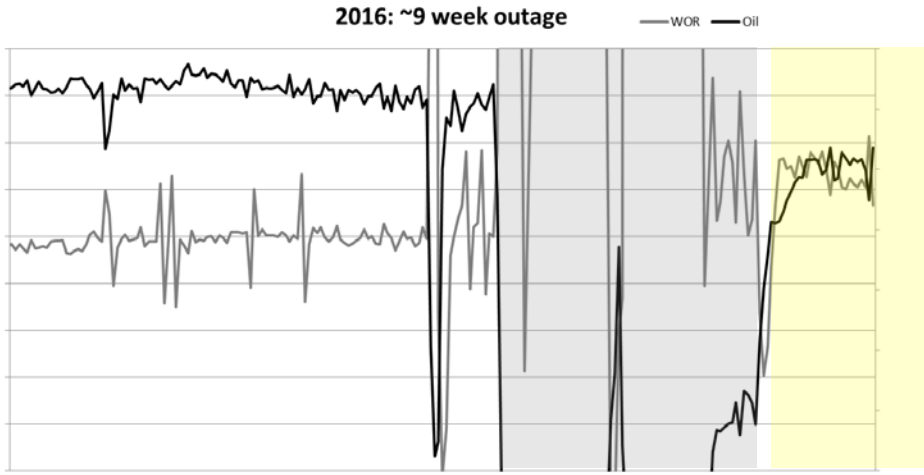


Key Learnings - Time to Recovery





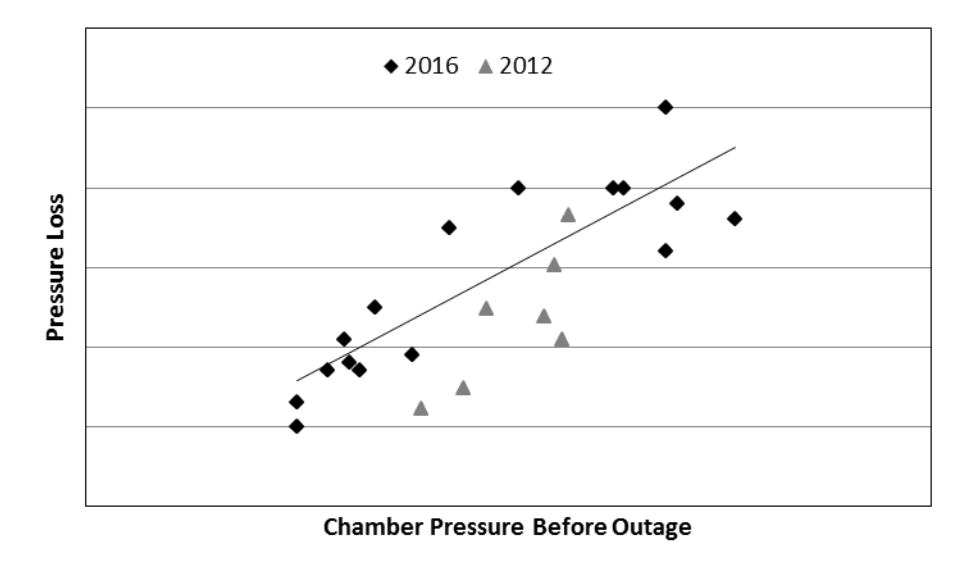




- Gray boxes roughly outline the durations of each of the past outages and upsets. Yellow boxes show period in which water cut recovers to pre-outage;
- Duration of the outage is equivalent to the duration of the recovery period following it:
  - Expect the current recovery to continue until about the middle of September.

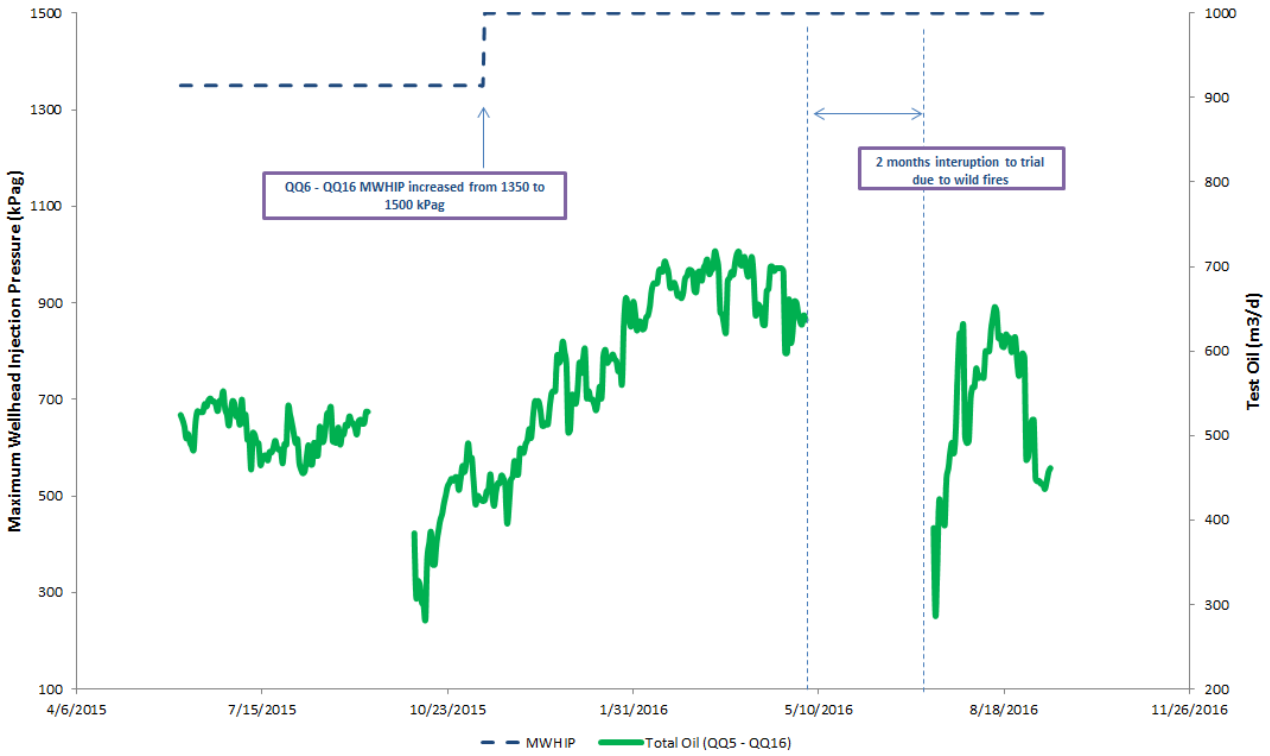
Key Learnings - Chamber Pressure

- Chamber pressure losses were seen across MacKay River, ranging from 50 to 250 kPa;
- Larger pressure losses were seen:
  - Wells operated at higher chamber pressures;
  - In less mature, non-coalesced, steam chambers;
- This is in agreement with data collected during previous outages;



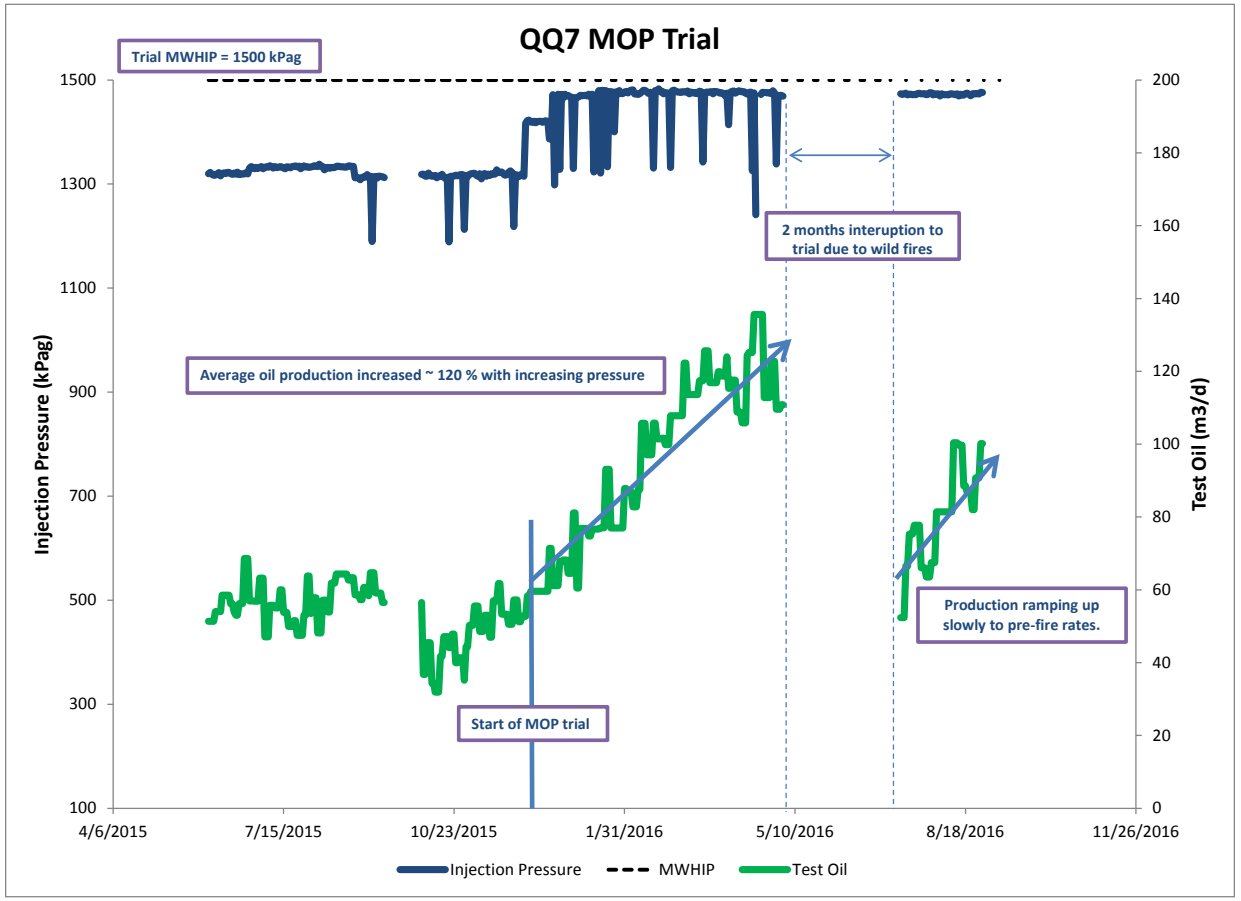
- Work is ongoing to rebuild chamber pressures where feasible and economic to do so.

Key Learnings - MOP Trial Overview



- AER approval received October 9, 2015:
  - QQ5: MWHIP increased from 1370 to 1525 kPag, bottomhole MOP increased from 1210 to 1370 kPag;
  - QQ6-QQ16: MWHIP increased from 1350 to 1500 kPag, bottomhole MOP increased from 1200 to 1350 kPag;
  - Trial was conducted to QQ6-QQ16 as the wells have the lowest MOP in the field resulting in production lift constraints.
- Most success has been seen on well pairs 6-10:
  - Limited geological challenges.
- Well pairs 11-16 have developed hotspots when steam injection pressures are increased.

Key Learnings - QQ7 MOP Trial Results



- The increase in MOP has had a significant impact on production;
- Average oil production has increased 120 %;
- Production impacted by fires;
- Well is slowly ramping up to pre-fire rates;
  - Rates similar to 2 months into the trial.

Key Learnings Pad 824 Update and Learnings

Pad 824 successfully converted to SAGD after circulation with a DSAGD completion

Ramp up has been impacted by the wildfires but rates are increasing as expected

- Wells were shut in for 80 – 90 days (including re-circulation time).

Key Learnings

- The successful conversion of Pad 824 shows that it is possible to circulate a well with a DSAGD completion at MacKay River
  - The previous DSAGD completions in Firebag were bullheaded.
  - The ESPs started up successfully after steaming past them
- The VX meter has been valuable in understanding the real time impact of operating parameters (injection pressures and rates) on well performance.

Steam Injection Conditions

Pattern	Wells	Maximum Operating Pressure*	
		Surface (kPag)	Bottomhole (kPag)
A	A1-7	2120	1690
B	B1-7	2020	1600
C	C1-6	1745	1390
D	D1-5	1555	1240
E (S)	E1-4	1640	1310
E (N)	E5-7	1600	1270
F	F1-7	1680	1340
G	G1-7	1935	1530
H	H1-4	2225	1780
NN	NN1-5	2100	1680
NN	NN6-10	2185	1750
NN	NN11-16	2125	1700
OO	OO1-3	1870	1490
OO	OO4-9	1910	1520
OO	OO10-15	1880	1500
QQ	QQ2-5	1535	1210
QQ	QQ6-10	1500	1200
QQ	QQ11-16	1500	1200
824	824WP1-2	2320	2060

- Approved MOPs based on the methodology detailed in Application 1724610;
- Approved Bottomhole MOP at 80% of the fracture closure pressure;
- MOPs are set by shallowest point in each pattern to allow for intra-pattern; communication;
- Steam injection pressure limits are enforced at wellhead on tubing and annulus via pressure transmitters. Phase 1 wells are monitored via manual pressure measurement at the wellhead every second day;
- Steam injection pressure is reduced as required to maintain estimated bottomhole pressure below MOP for neighboring patterns in communication.

 *Commercial Scheme Approval No. 8668OO

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Stewardship to maximum bottomhole operating pressure

Pattern	Wells	Maximum Operating Pressure*	Average pressure Sep 14- Aug 15
		Bottomhole (kPag)	Bottomhole (kPag)
A	A1-7	1690	1241
B	B1-7	1600	1168
C	C1-6	1390	1119
D	D1-5	1240	956
E (S)	E1-4	1310	1029
E (N)	E5-7	1270	1177
F	F1-7	1340	1092
G	G1-7	1530	1142
H	H1-4	1780	1420
NN	NN1-5	1680	1267
NN	NN6-10	1750	1261
NN	NN11-16	1700	1537
OO	OO1-3	1490	1101
OO	OO4-9	1520	1251
OO	OO10-15	1500	1328
QQ	QQ2-5	1210	1128
QQ	QQ6-10	1200	1219*
QQ	QQ11-16	1200	1059
824	824WP1-2	2060	

*** Suncor has temporary approval to be above the 80% limit for QQ6-16**

- All of the Mackay wells in SAGD are currently operating at pressures below the new approved 80% maximum bottomhole operating pressure;
- Alarm systems are in place to ensure the approved maximum bottomhole operating pressures are not exceeded;
- Steam injection pressure is reduced as required to maintain estimated bottomhole pressure below maximum bottomhole operating pressure;
- 824 - Inadequate chamber development to obtain a valid bottomhole pressure.

Impact

- Lower production rates in low MOP areas;
- Slower ramp-up post planned outtage's;
- Impacts new well conversions in low MOP areas;
- Small impact to mature wells performance.

Stewardship to maximum bottomhole operating pressure

- For SAGD wells with no downhole instrumentation **Step-down Tests (SDT)** and **Low Rate Tests (LRT)** are performed and used to calculate estimated chamber pressure to ensure that the Maximum Bottomhole Injection Pressure (MBHIP) is not exceeded;

- **SDTs** are conducted by lowering the steam injection rate in steps and allowing pressures to stabilize between steps;

- **LRTs** are conducted on wells that do not have reliable SDT correlations by reducing the steam injection rates low enough to estimate the chamber pressure;

- **SDT** is the preferred method for chamber pressure estimation as it allows for real time chamber pressure monitoring based on changing injection rates;

Pad Abandonment Outlook

- The strategy for future well and pad (including surface equipment) abandonments is under development;

- Do not anticipate abandonment of operating Pads during the next 5 years:
  - Pads 20 and 21 (A/C and B/D patterns) are the most mature and are expected to be under pressure maintenance within 5 years;
  - Individual wells may be suspended or abandoned as required.

- Pad 40 expected to be abandoned within the next 5 years :
  - Three of four wells on pad abandoned (NP, NI and SP);
  - Considerations for surface equipment are under review.

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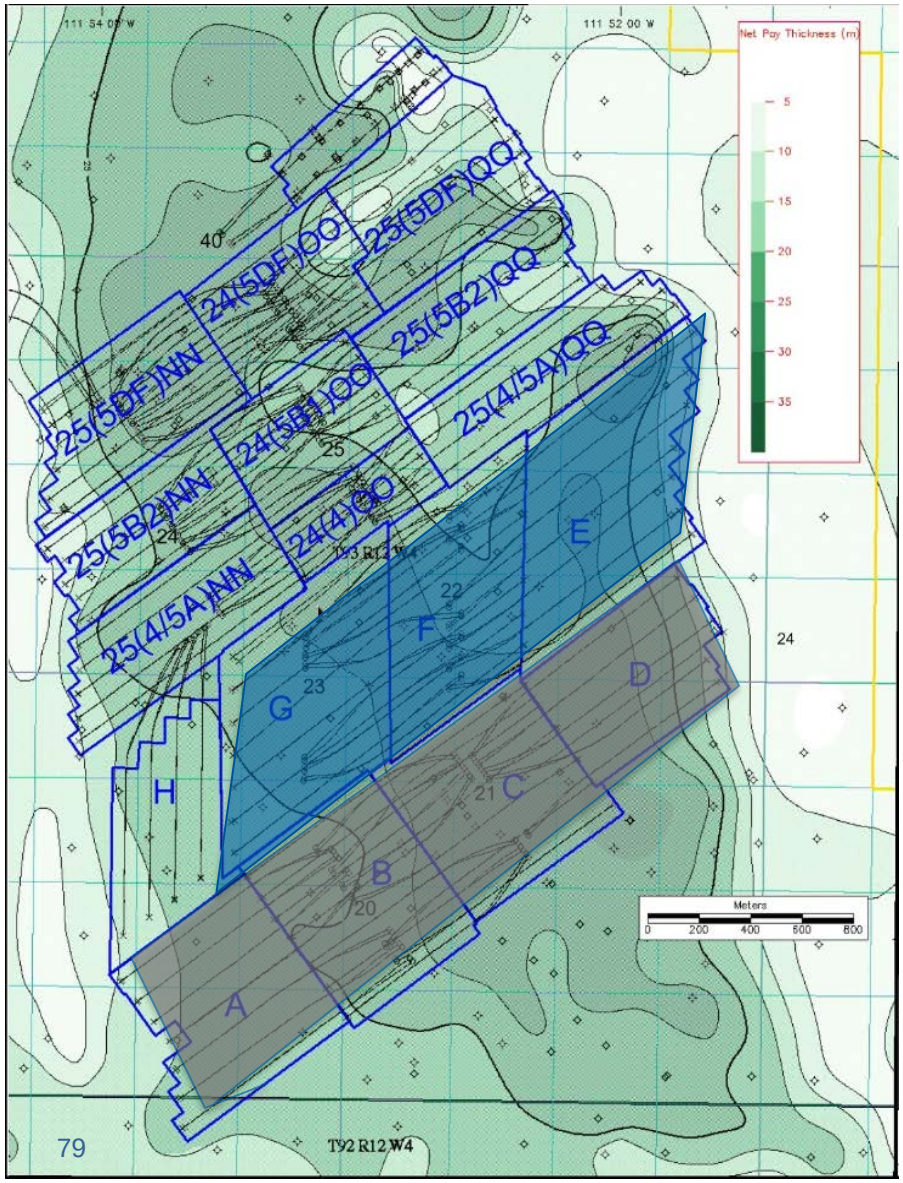
SAGD NCG Co-Injection Strategy



Pilot

- NCG co-injection into B pattern commenced October 2011;
- Pilot infrastructure left in place until Stage 1 is operational;
- Injection currently based on steam availability.

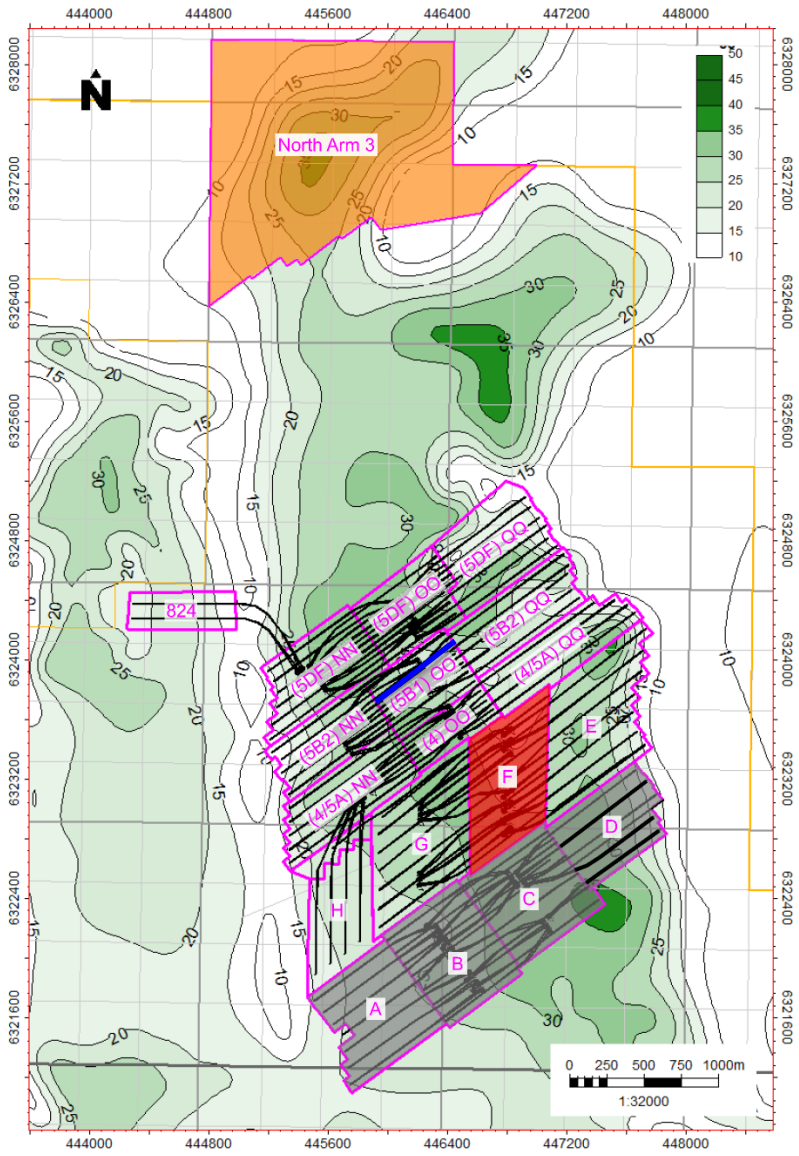
Stage 1

- NCG co-injection to A, B, C, D patterns currently approved;
- Expect First NCG Co-Injection Q4 2016;
- Plan to reduce and reallocate steam to other pads to optimize field.

Stage 2

- NCG co-injection into E, F, G, patterns work in progress;
- Planning First NCG Co-Injection Q3 2017.

NEW TECHNOLOGY PROJECTS – NEAR TERM



NCG Co-Injection Expansion (A/B/C/D)

- First injection planned for Q4 2016.

Surfactant Chemical Pilot (D2/D4/D5)

- Injection Feb 2015 to April 2016;
- Post-pilot monitoring in progress.

Surfactant Co-Injection Pilot Expansion (F)

- First Injection planned for Q4 2016.

CO2 Co-Injection Pilot Well (OO8)

- First injection started for April 2016 but has since been suspended due to the Fort McMurray Fire:
  - Expected to restart October 2016.

North Arm 3

Solvent Technology:

- Demonstration facility currently at scoping stage;
- Integrated Application expected for Q4 2016.

MacKay River Performance Presentation

Caprock Integrity

MacKay River Coupled Geo-Mechanics/Reservoir Workflow

1 - Data Gathering
- SAGD well operations (Rate/Pressure)
- Ob well pressure (Piezometer)
- Ob well temperature (Thermocouple/Fiber)
- Surface heave (Monuments)
- Cores and borehole image log analysis
- Rock geo-mechanical properties (Lab tests)
- In situ stress (mini-frac tests)

2 – Data Interpretation

Reservoir Physics
- Well performance
- Pressure Leak-off
- Heat transfer

Geo-Mechanics
- Stress state
- Rock behavior
  - Shear failure conditions
  - Tensile failure conditions
  - Permeability change
- Thermal expansion
- Reservoir level deformations

3 - Coupled Reservoir Geo-Mechanics
- Update pressures and temperature
- Update stress state
- Recalibrate models using history match to field data
- Forecast/Design for safe development

4 - Learnings
- Sensitize key variables within uncertainty range
- Quantify geo-mechanical risks
- Verify and update MOP
- Recommend/Design further measurements / lab tests

Geo-Mechanical analysis for safe optimal MacKay River operations

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Dataset for Characterization of Natural Fractures

2005/06:
- Image logs for 15 wells,

2007/09:
- Cores and/or image logs for 17 wells,

2010/11:
- 17 wells with cores and image logs;
- 10 wells with only image logs.

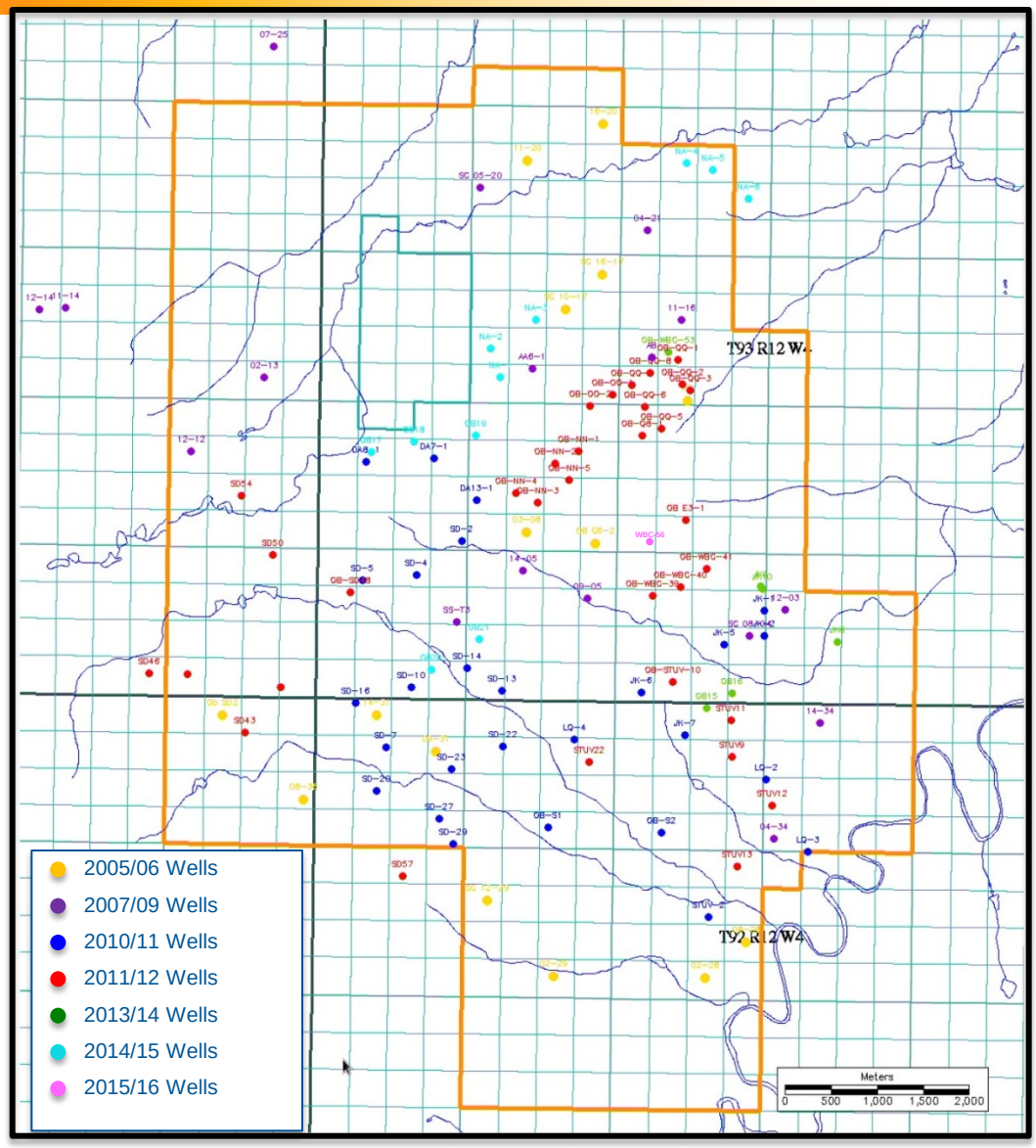
2011/12:
- Cored 6 wells;
- FMI logs for 27 wells.

2012/13:
- No wells were drilled.

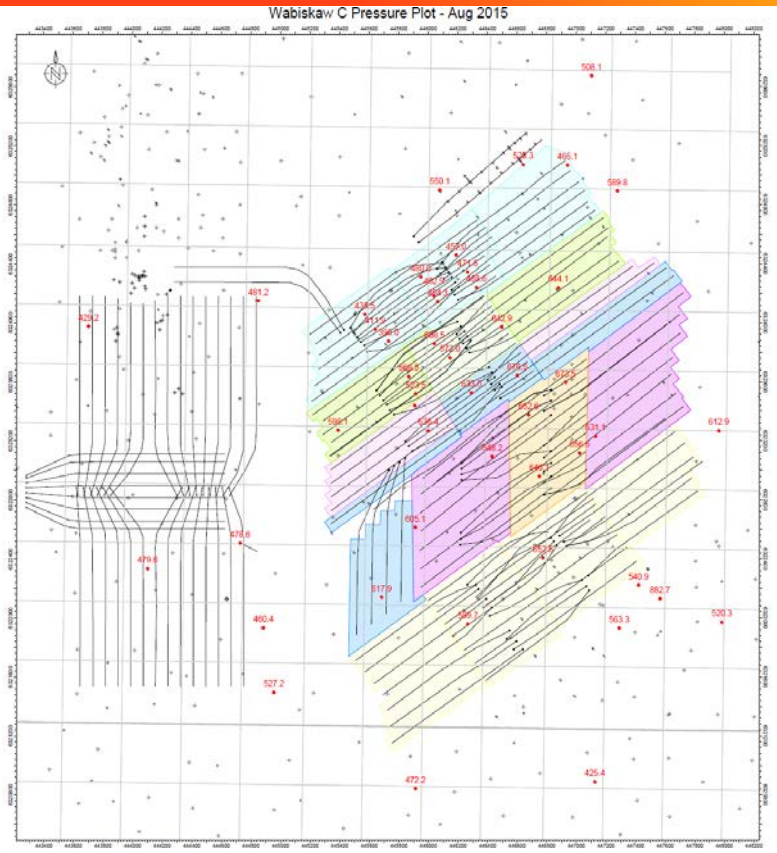
2013/14:
- Cored 3 wells;
- FMI logs for 3 wells.

2014/15:
- Cored 2 wells;
- FMI Logs for 11 wells.

2015/16:
- FMI Log for 1 well.



Monitoring: Wab C Pressure & Temperature



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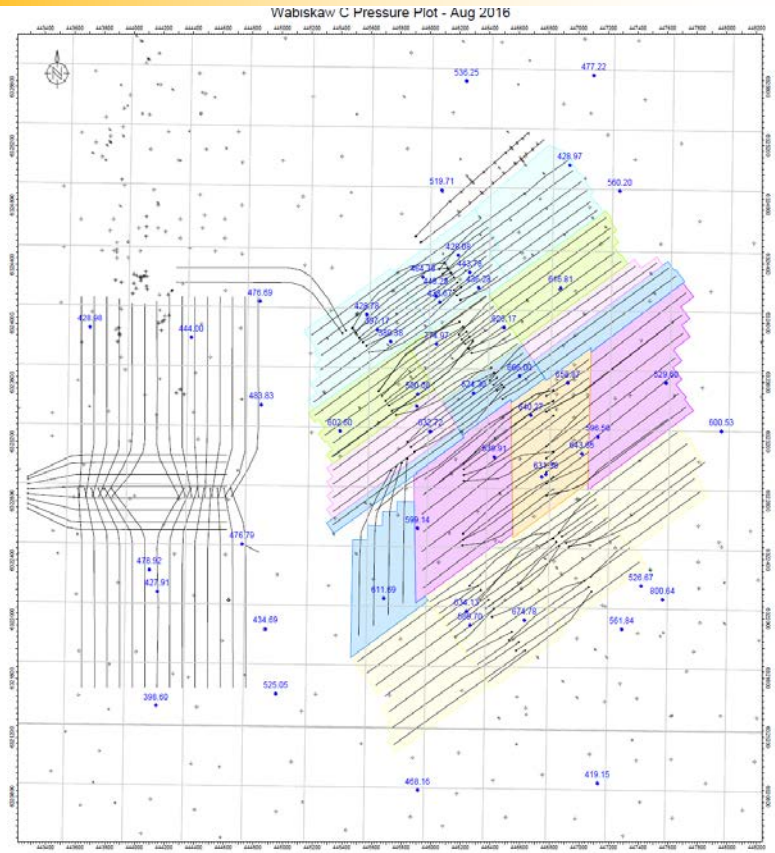


Average pressure decrease of 15 kPa from August 2015 to August 2016 :

- Pressures are below hydrostatic and well below fracture pressures.

12 Wabiskaw C wells with elevated temperatures (>30°C) directly above mature SAGD operations:

- 4 wells between 90°C and 141°C - 8 wells between 30°C and 90°C.
- Elevated temperatures are within the expected range as depicted by heat conduction calculations;
- Ongoing analysis and simulation efforts are continuing to further understand underlying mechanisms.

Monitoring: Wab C Alarms

- Observation well data is reviewed bi-weekly and automated alarms initiate proactive, more detailed daily review of data. The following alarm settings are used for the automated alarms:
  - High pressure – set to alarm at 60% of fracture pressure at gauge depth in the OB wells (12.6 kPag/m);
  - Rising pressure – set to alarm if the pressure increase is >25 kPa/day;
  - High temperature – set to alarm at 20 C subcool of steam temperature calculated using the OB well pressure as assumed steam saturation pressure;
  - Rising temperature – set to alarm if temperature increase is > 5 ^{o}C/day;
  - The set point for the proactive alarms result in daily alarms if set conditions are exceeded; review of current alarms has resulted in no safety concerns.

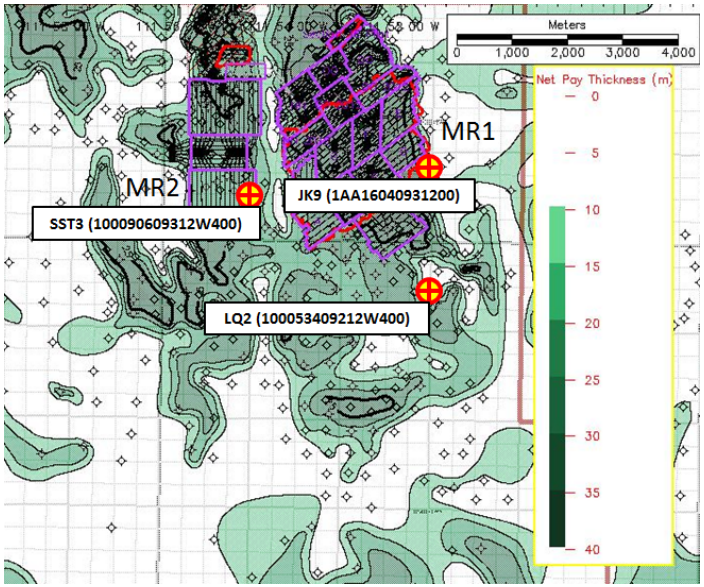
Monitoring: Wab C Response

- In the event that pressure or temperatures are nearing levels of concern Suncor will:
  - Confirm the alarm pressure or temperature, and if accurate;
  - Decrease injection pressure in the offsetting injection wells as appropriate;
  - Monitor the response and adjust operations as required.
- No alarms have resulted in the above actions to be performed.

Geo-Mechanics: Mini-frac Test

- No mini-frac tests conducted since last reporting period;
- Fracture gradient within operating area still holds at or above 21 kPag/m:
  - Fracture gradient measured (kPag/m) from mini-frac test.

Formation	JK-9 (2014)	SST3 (2008)	LQ2 (2011)
McM		19.9	21.1
WabD	22.1	24.3	22.6
WabA	21.1		21.2
CW	22.3	24.1	21.3



Geo-Mechanics: Geo-mechanical Simulation Studies

Continuous Improvement to Geomechanical Models:

- Continued calibration of the model with an integrated dataset (SAGD performance data, pressure and temperature data acquired from the WabC and McMurray, surface heave);
- Verified sufficient factor of safety to tensile and shear failure in the caprock.

Review of Geomechanical Model Prior to 750 Start-up:

- Results indicate that the current MOP design for the 750/751 development continues to provide sufficient factor of safety to tensile and shear failure in the caprock.

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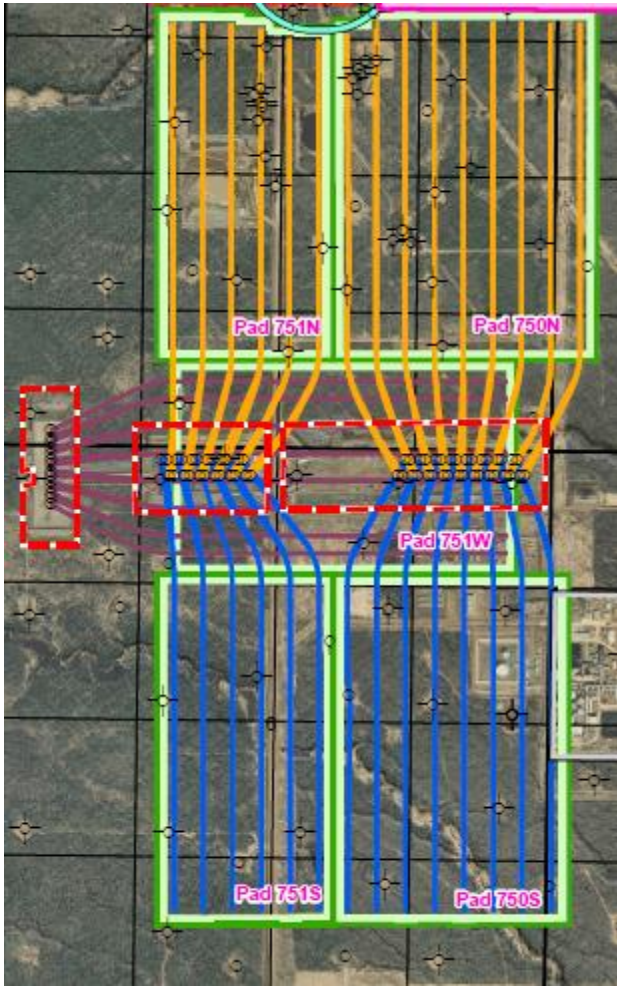
MacKay River Performance Presentation

Future Plans

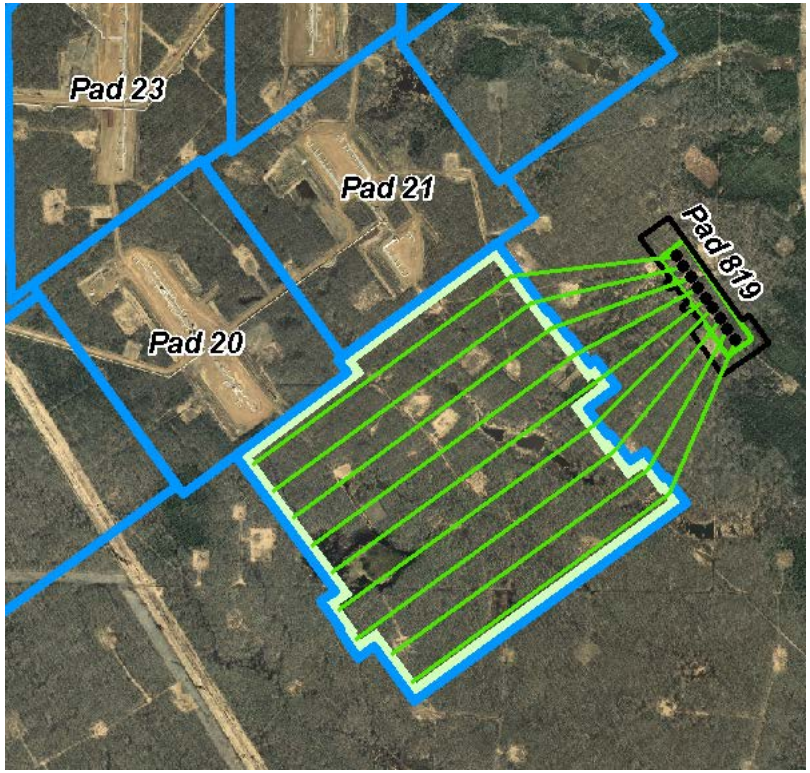
Future Development: Pads 750/751

- Pad 750/751 is a future area of development within the MacKay River PA:
  - To provide sustaining production for the existing MR1 central processing facility (CPF).
- Approval received August 7, 2012:
  - 35 well pairs and 2 single producers.
- Drilling completed June 2014;
- First Steam for Pad 750 in September 2016;
- To maintain maximum MR1 CPF capacity:
  - Pad 751 and remaining Pad 750 completions will occur in 2018/2019.
  - First Steam for Pad 751 expected in 2020.



Future Development: Pad 819

- Pad 819 is a future area of development within the MacKay River PA:
  - To provide sustaining production for the existing MR1 central processing facility (CPF).
- Directive 078 amendment approval received in January 2014:
  - 9 well pairs located south of existing infrastructure.
- Drilling planned to be completed in 2020;
- First steam expected in 2022.



MacKay River Performance Presentation

Responses to Additional Questions

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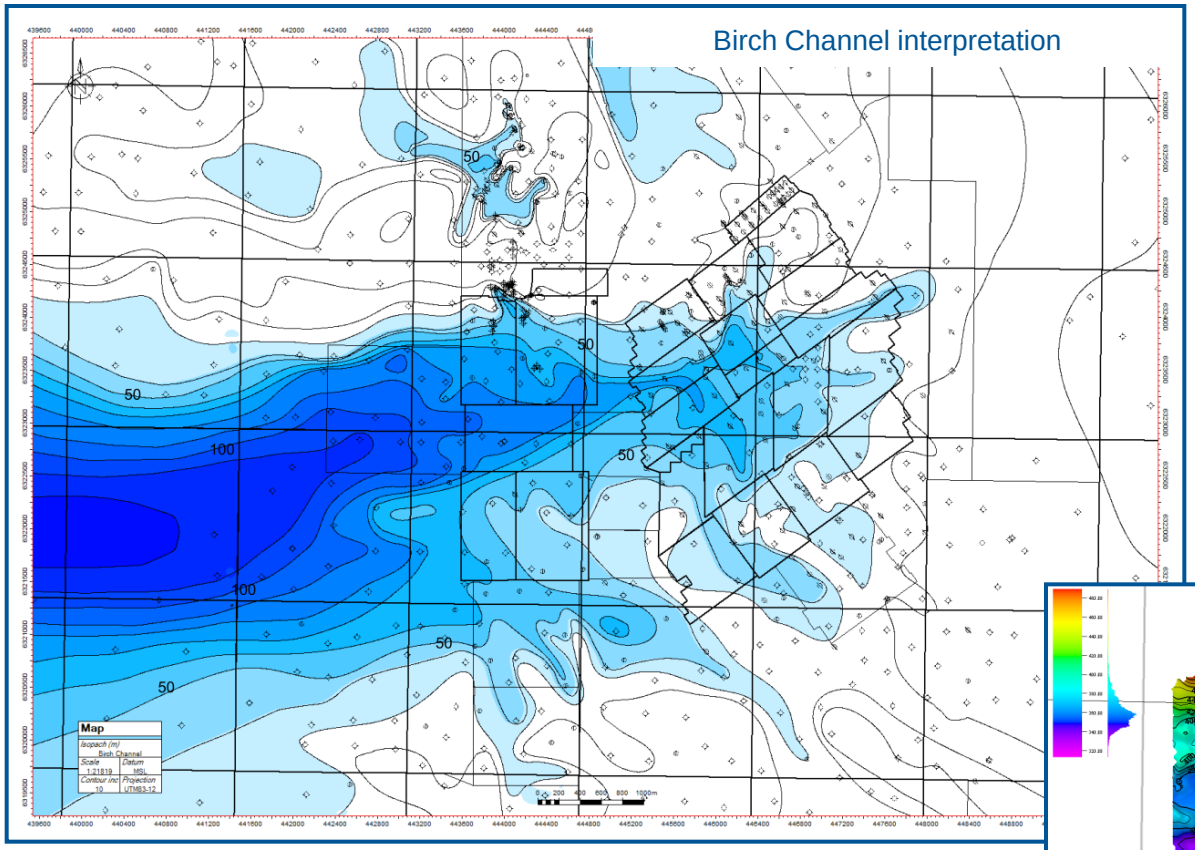
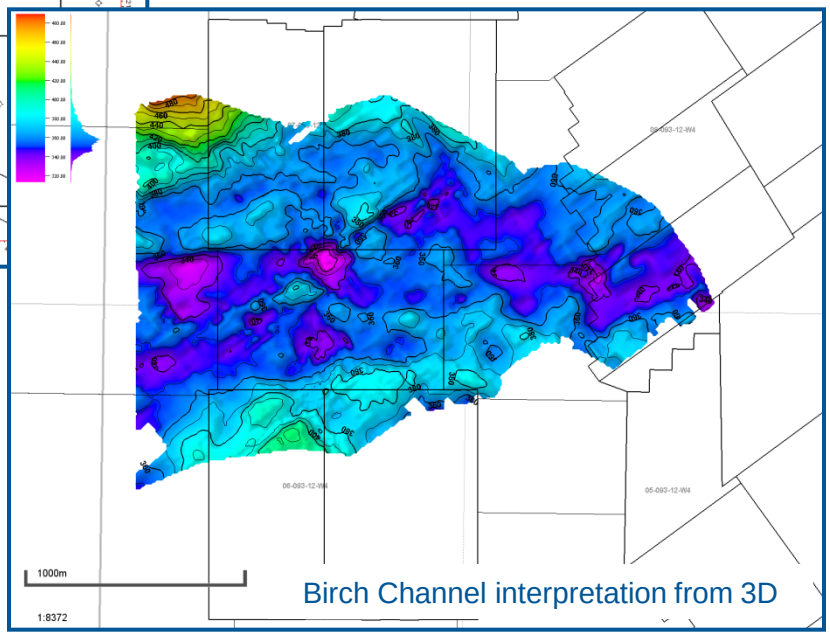
Birch Channel Aquifer



10m Contour Intervals

- Birch Channel interpreted throughout MacKay River producing area
  - West of producing area, channel thickens as reservoir deepens



480 – 320 ssTVD (m)
10m Contour Intervals

Birch Channel interpretation from 3D

Groundwater Monitoring at Mackay River: Monitoring Network and Chemistry

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Outline

- Monitoring Network in the Birch Channel
  - Water Well Licensing
  - Drawdown at Observation Wells
- Thermal Mobilization Effects
  - Temperature
  - Chemistry

Water Well Licensing

Facility	Water Well Licence	Well ID	Volume diverted in 2015 /m3	Maximum Annual Volume / m3
MacKay River	00338812-00-00	BC-MW-270-44	2,091	7,154
	00188229-02-00	GD-SW-212-53 GD-SW-213-86 and GD-SW-215-91	507,308	511,000
	TDL No. 375567	GD-SW-212-53 GD-SW-213-86 and GD-SW-215-91	22,832	32,290
	00289164-00-00	WSW 5, 6, and 7	0	876,000
	00249470-01-00	CWSW-SW-218-55	0	25,550

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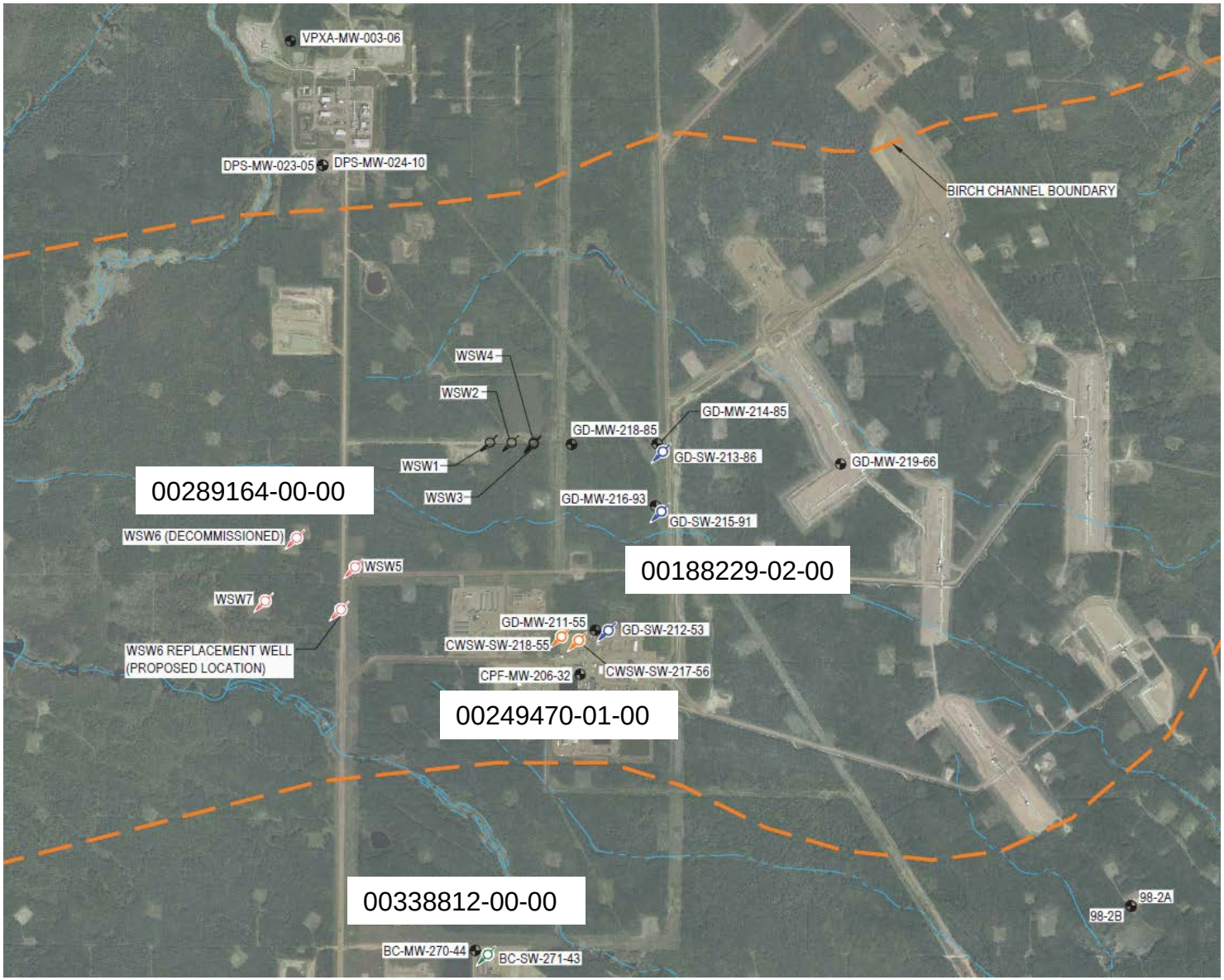
MacKay WSW & MW Locations



SITE PLAN SHOWING WATER SOURCE WELLS AND OBSERVATION WELLS

LEGEND

- WATER SOURCE WELL (MR2)
- WATER SOURCE WELL (MR1)
- WATER SOURCE WELL (DOVER)
- WATER SOURCE WELL (CAMP)
- WATER SOURCE WELL (BASELINE CAMP)
- OBSERVATION WELL
- WATERCOURSE
- BIRCH CHANNEL BOUNDARY

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Water Conservation And Allocation Guideline for Oilfield Injection (2006)

- Drawdown in the production aquifer, as measured at an observation well at a distance of 150 metres from the production well, to 35% of available head during the first year of operation and no more than 50% of available head over the life of the project.

Observation Well	Pumping Well	Approximate Distance Between Observation and Pumping Well (m)	Saturated Thickness* (m)	Available Head** (m)	50% of Available Head (m)	Maximum Measured Drawdown at Observation Well (m)***
GD-MW-211-55	GD-SW-212-53	20	26	17	8.67	1.72
GD-MW-214-86	GD-SW-213-86	20	56	37	18.67	2.44
GD-MW-216-93	GD-SW-215-91	20	57	38	19.00	0.18
BC-MW-270-44	BC-SW-271-43	20	27	18	8.96	0.85

* Based on Worley Parson's Report " Additional Water Withdrawal Application (WP, 2011)

** Calculated as 2/3 of saturated thickness

***Maximum Drawdown Measured in 2015

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Well Pads & Groundwater Monitoring Network

LEGEND

- MONITORING WELL
- GROUNDWATER DIVERSION WELL
- MONITORING WELL (NOT MONITORED IN 2014)

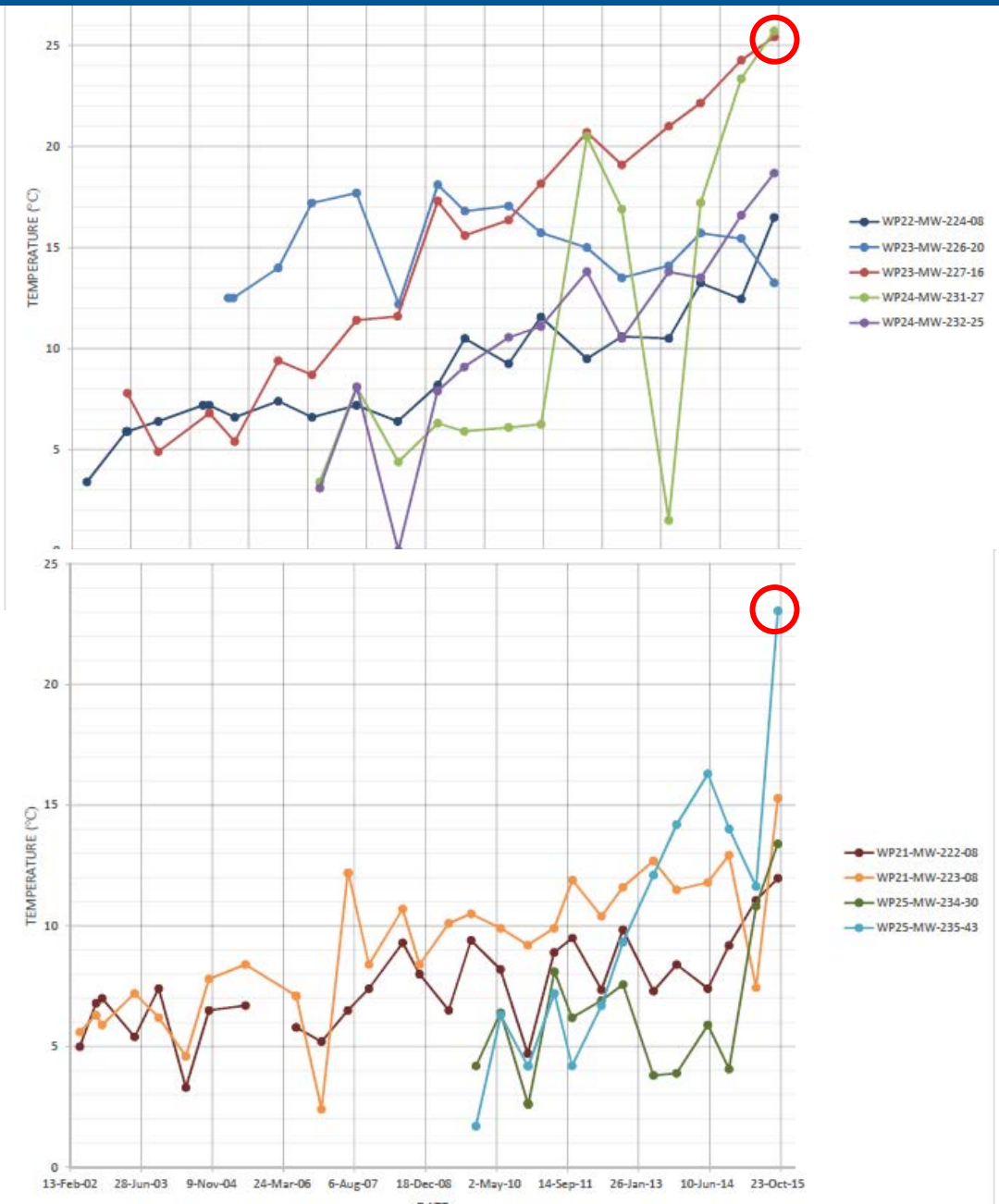
Groundwater Temperature

- Elevated temperature observed in several wells:

WP22-MW-224-08, WP23-MW-226-20, WP23-MW-227-16, WP24-MW-231-27, WP24-MW-232-25, WP21-MW-222-08, WP21-MW-223-08, WP25-MW-234-30, WP25-MW-235-43

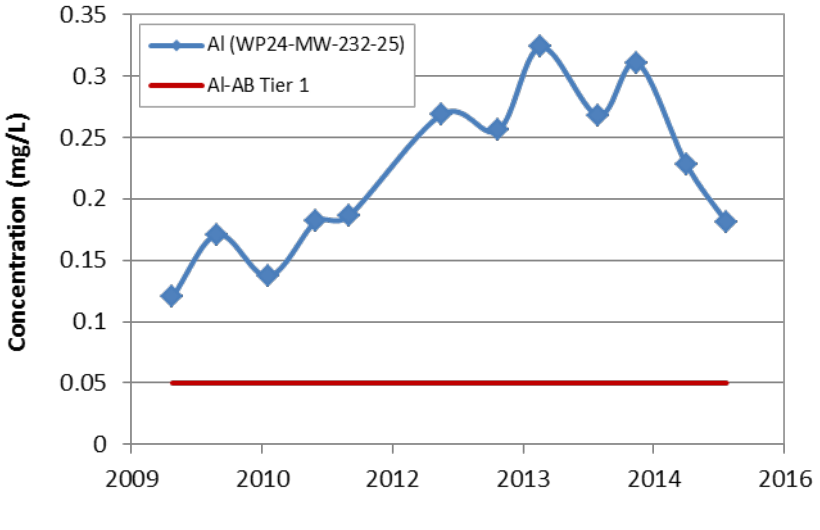
- Maximum temperature is ~ 26°C (WP24-MW231-27)

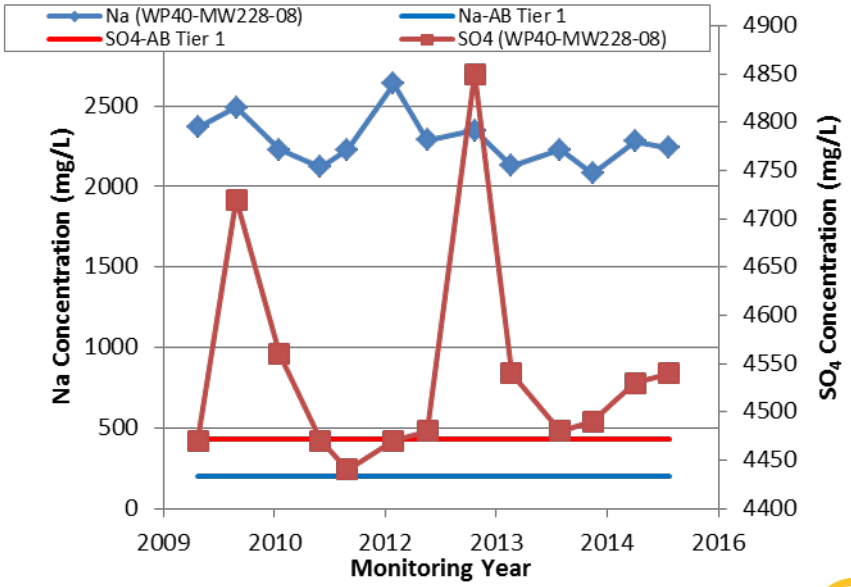
- 2016 monitoring ongoing. Update to be provided in the 2016 compliance groundwater monitoring report



Groundwater Chemistry

- Sporadic exceedances for phenols, cadmium and selenium and increasing trend for aluminum (2009-2013)not due to temperature
- Occurrences of trace metals (Al, Fe, Mn) mediated by natural processes (microbial reductive dissolution) under anaerobic conditions
- Exceedances for sodium (WP40-MW-228-08 & WP25-MW-235-43) and sulphate (WP40-MW-228-08) are within historical ranges for these wells





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Suncor MacKay River Project
201 AER Performance Presentation: Surface Commercial Scheme Approval No. 8668

October 26, 2016

Reporting Period September 1, 2015 – August 31, 2016

AER Directive 054
2016 Performance Presentation

Section 3.1.2 – Surface Operations, Compliance, and Issues not related to Resource Evaluation and Recovery

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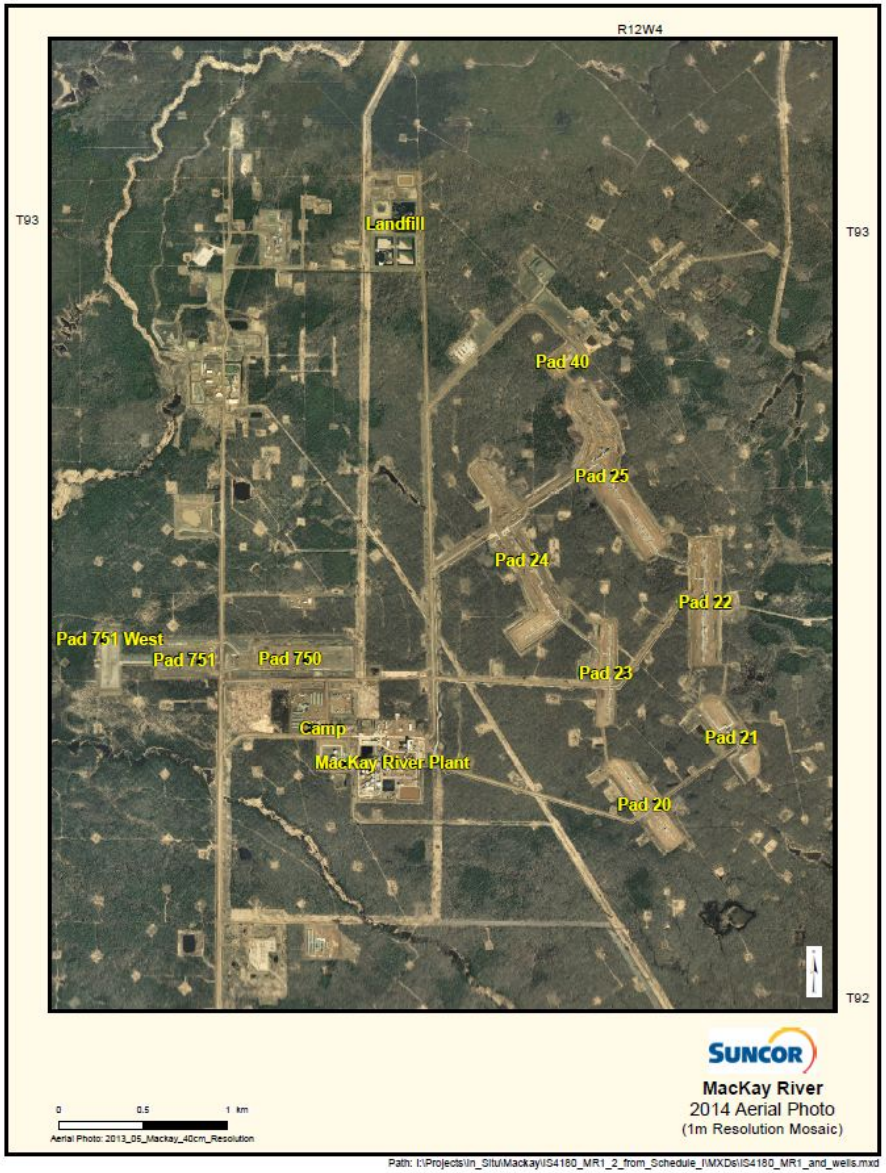
MacKay River Performance Presentation

Facilities

MacKay River Project Site



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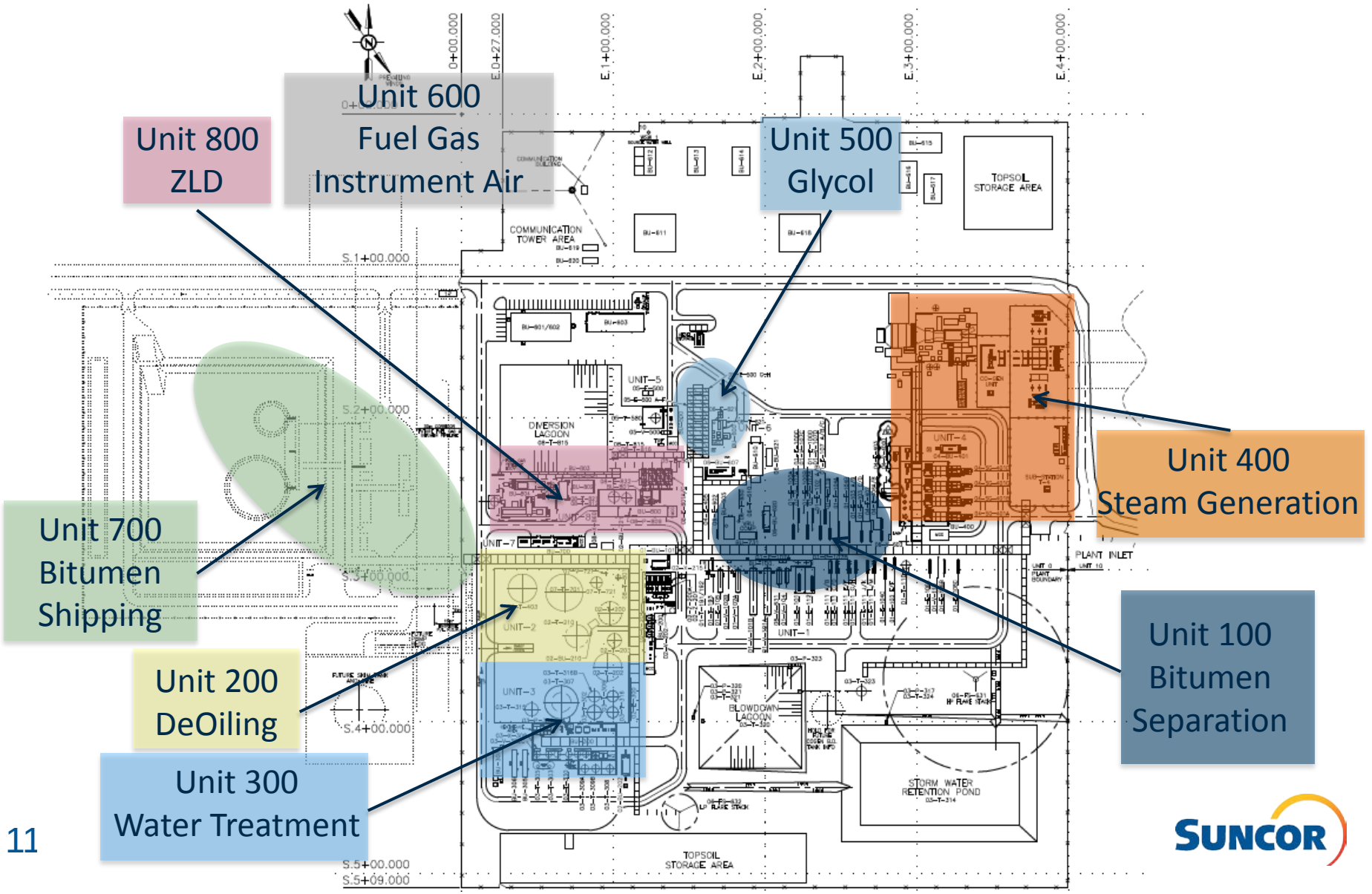
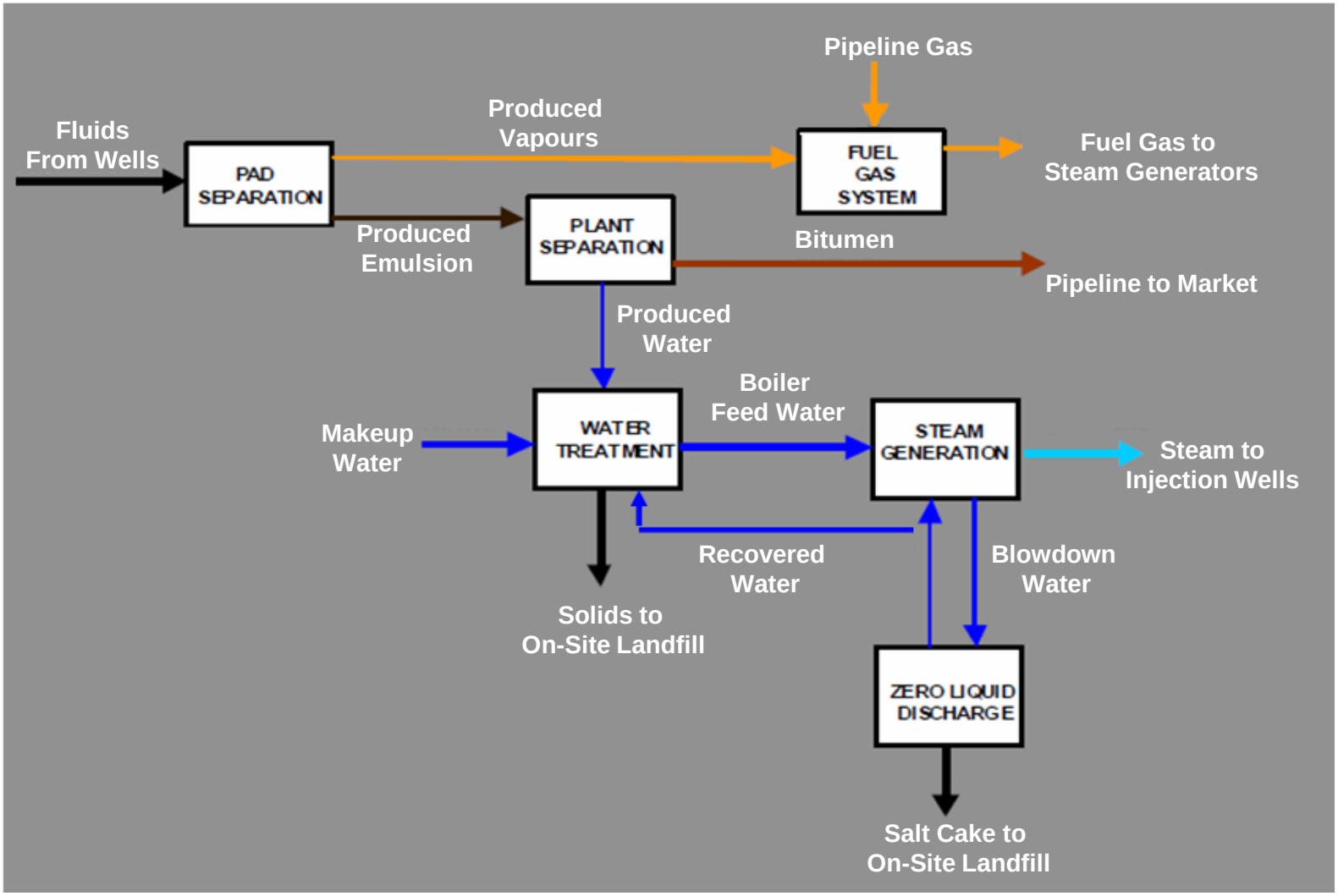
CPF Plot Plan



Simplified CPF Process Block Diagram



MacKay River Performance Presentation

Central Processing Facility Performance

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CPF Performance (September 2015 to 2016 YTD)

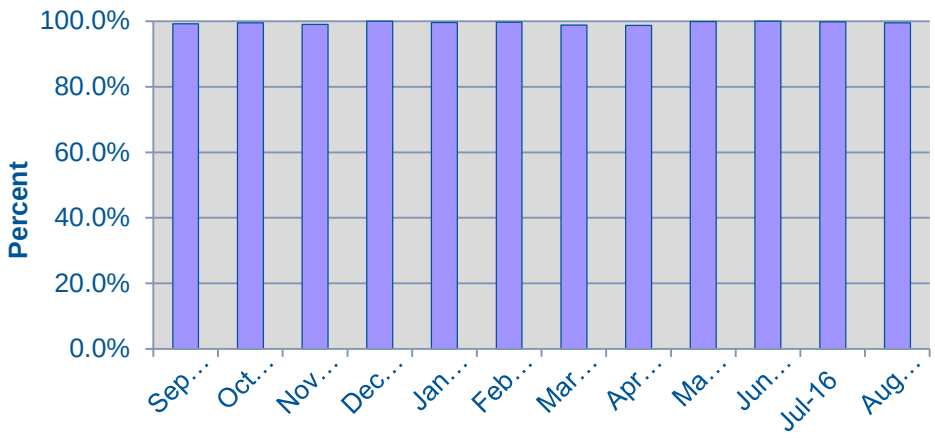
The reliability of the facility has been steady:

- Very stable CPF availability realized during the past year;
- Entering sustainment of OEMS, introduced years prior.

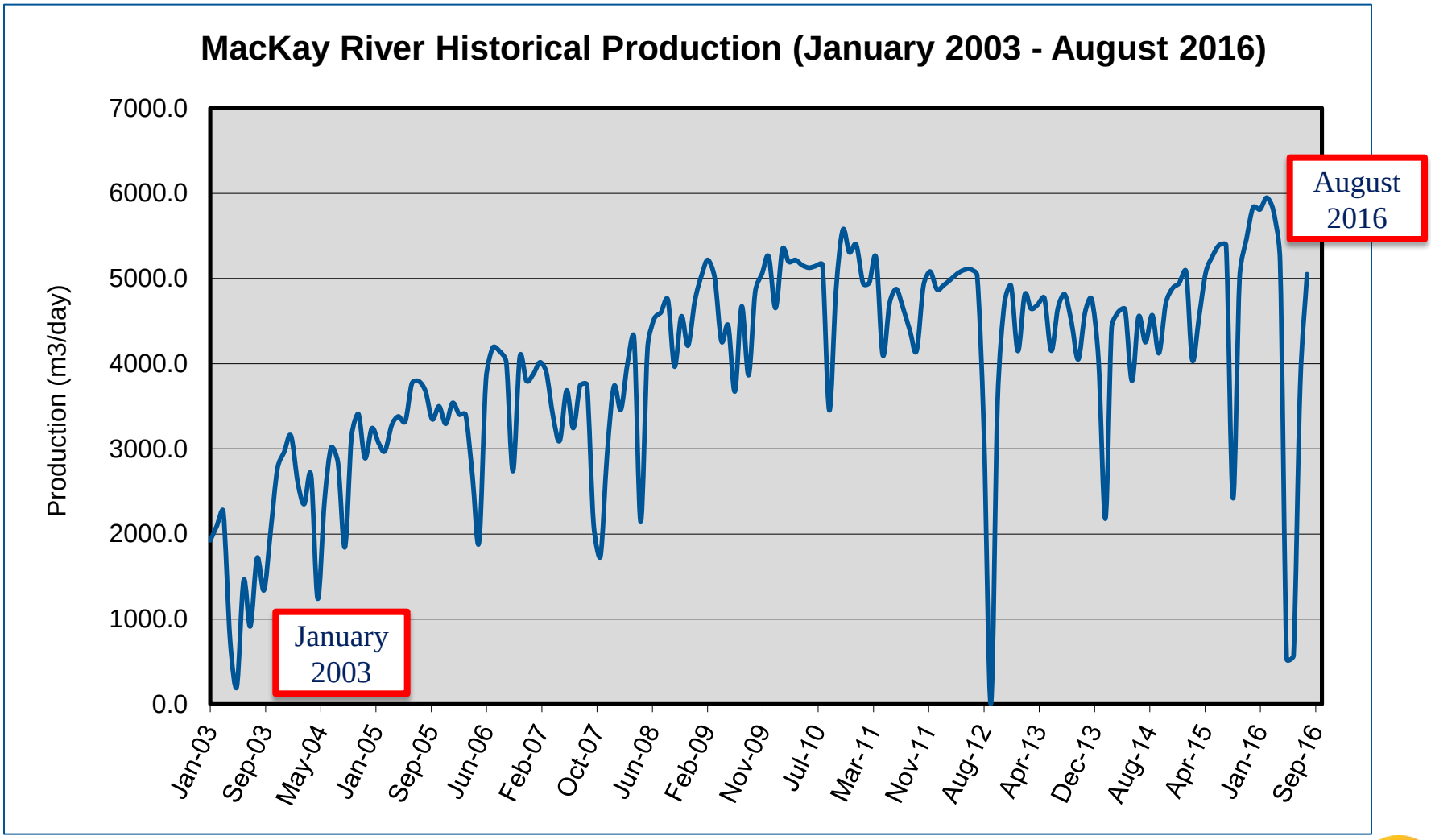
Major challenges:

- Fort McMurray wild fire evacuations caused disruption in production.;
- Impact on reliability limited as CPF was “available” to operate. CPF reliability is driven by internal events that impact production.

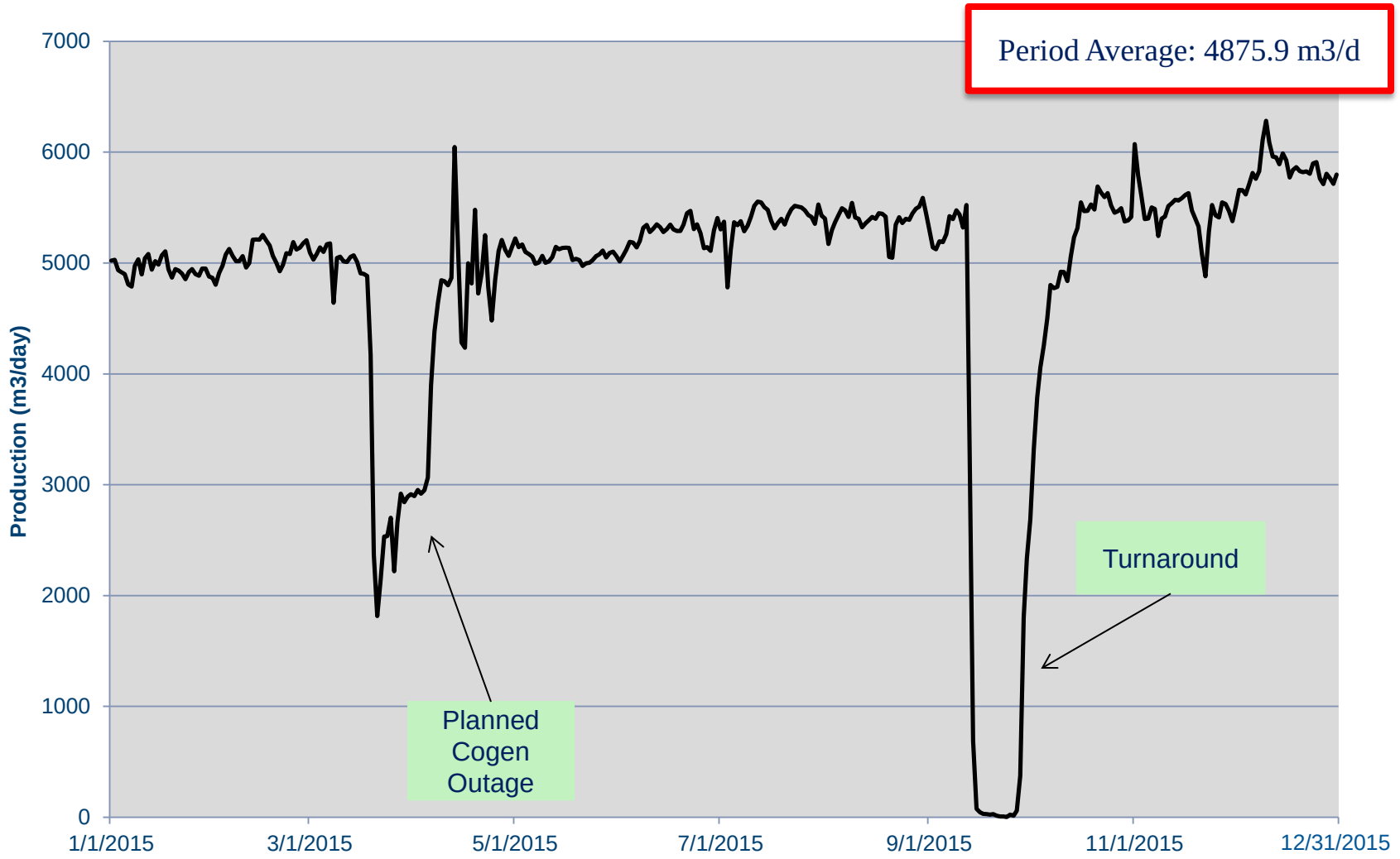
Average 99.5%
(September 2015 to August 2016)



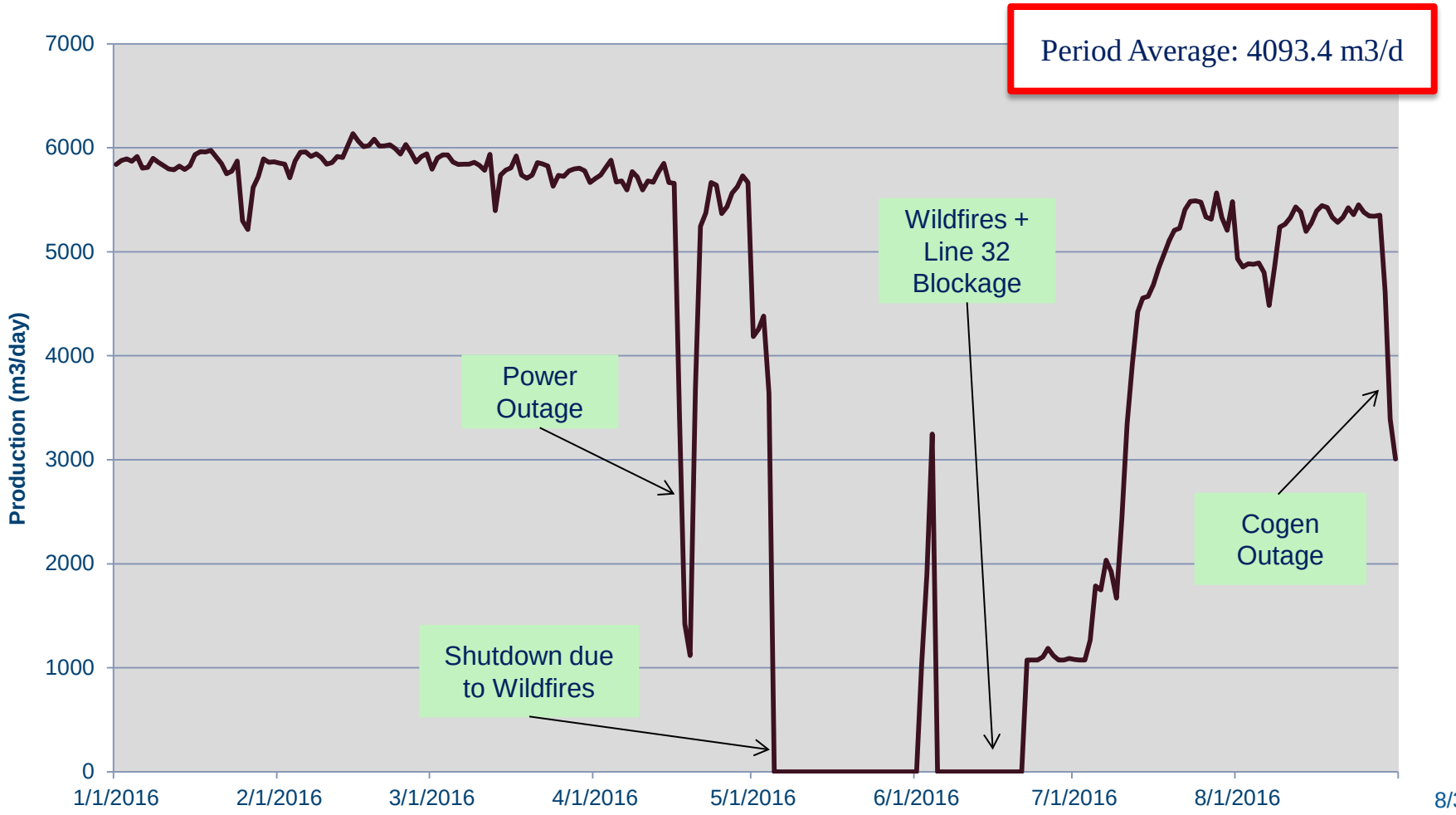
Historical Production (January 2003 – 2016 YTD)



Production (2015)



Production (January 2016 to August 2016)



Water Treatment Technology

Warm Lime Softening (WLS) and Weak Acid Cation (WAC) softening for produced water;

Zero Liquid Discharge (ZLD) System on blowdown slip stream:

- Evaporators: one steam and one mechanical driven;
- Crystallizer: Steam driven;
- Dryer: gas fired;
- Filter press (2): back up for dryer.

Boiler Feed Water Quality

Parameter	Avg. Value (Sept 2015 – Aug 2016)	Max Value During Period	BFW Specifications
Temperature, ºC	153.4	160.0	140 – 170
Hardness (Dissolved), mg/L	0.24	1.54	< 1.0
Total Dissolved Solids, mg/L	6544.4	10413.4	< 8000
Silica, as SiO2, mg/L	21.8	98.5	< 50.0

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Water Treatment Successes and Challenges

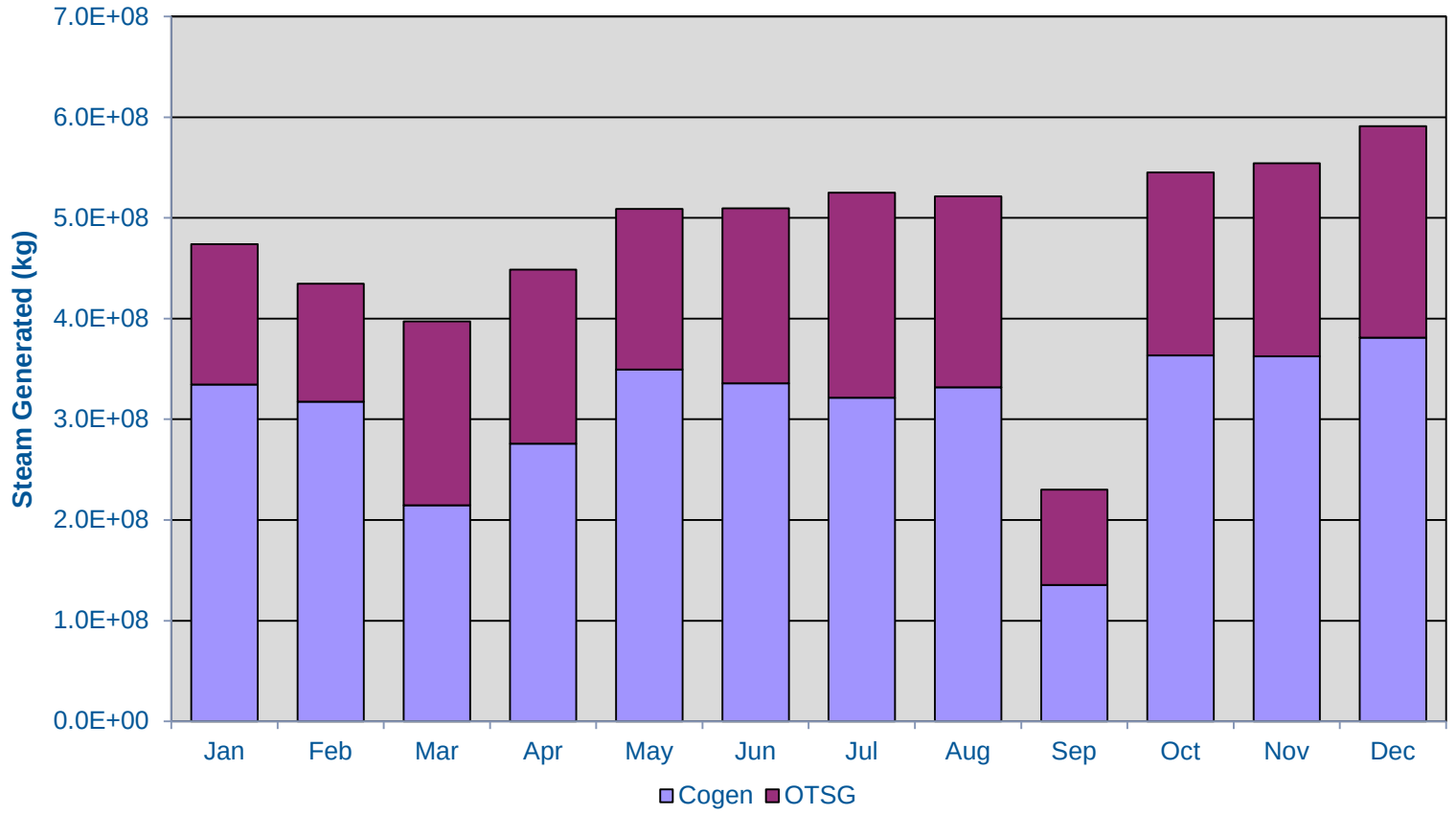
The WLS performance has been steady since :

- Reliability is 98% :
  - Consecutive days within spec: 215 days Parameters: temperature, hardness, total dissolved solids, pH, silica, oil, free oxygen, total dissolved iron;
  - Impact of Wildfires included in value: off-spec BFW conditions are very rare;
  - Reliability of the slurry system has improved significantly with new chemical treatment program.

Challenges:

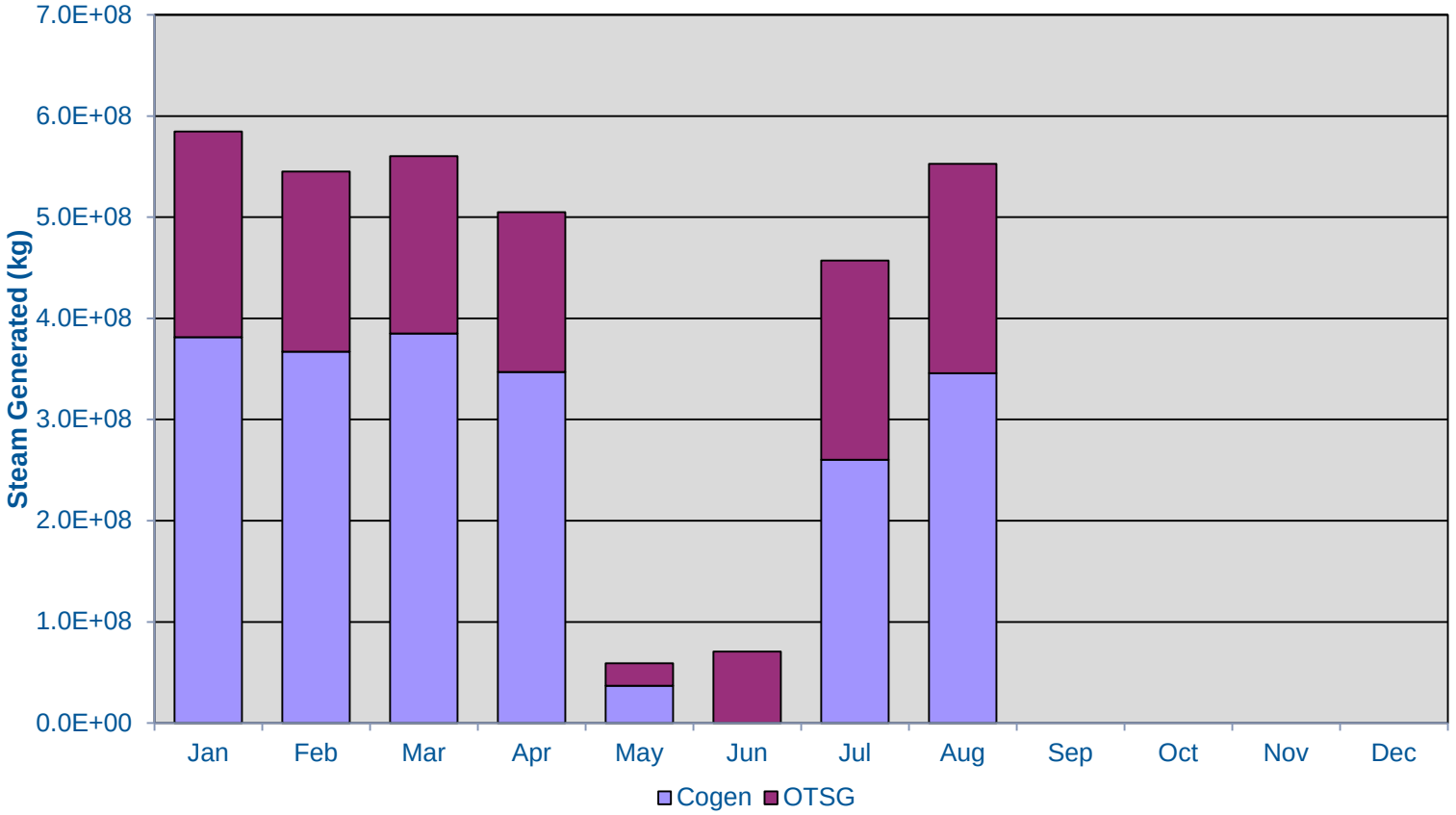
- Fort McMurray Wild fires caused 2 cold stand-by situations with little to no time to prepare for CPF shut down;
- Multiple CPF start-up situations and irregular operating modes impacted WLS outlet water quality.

Steam Generation (2015)



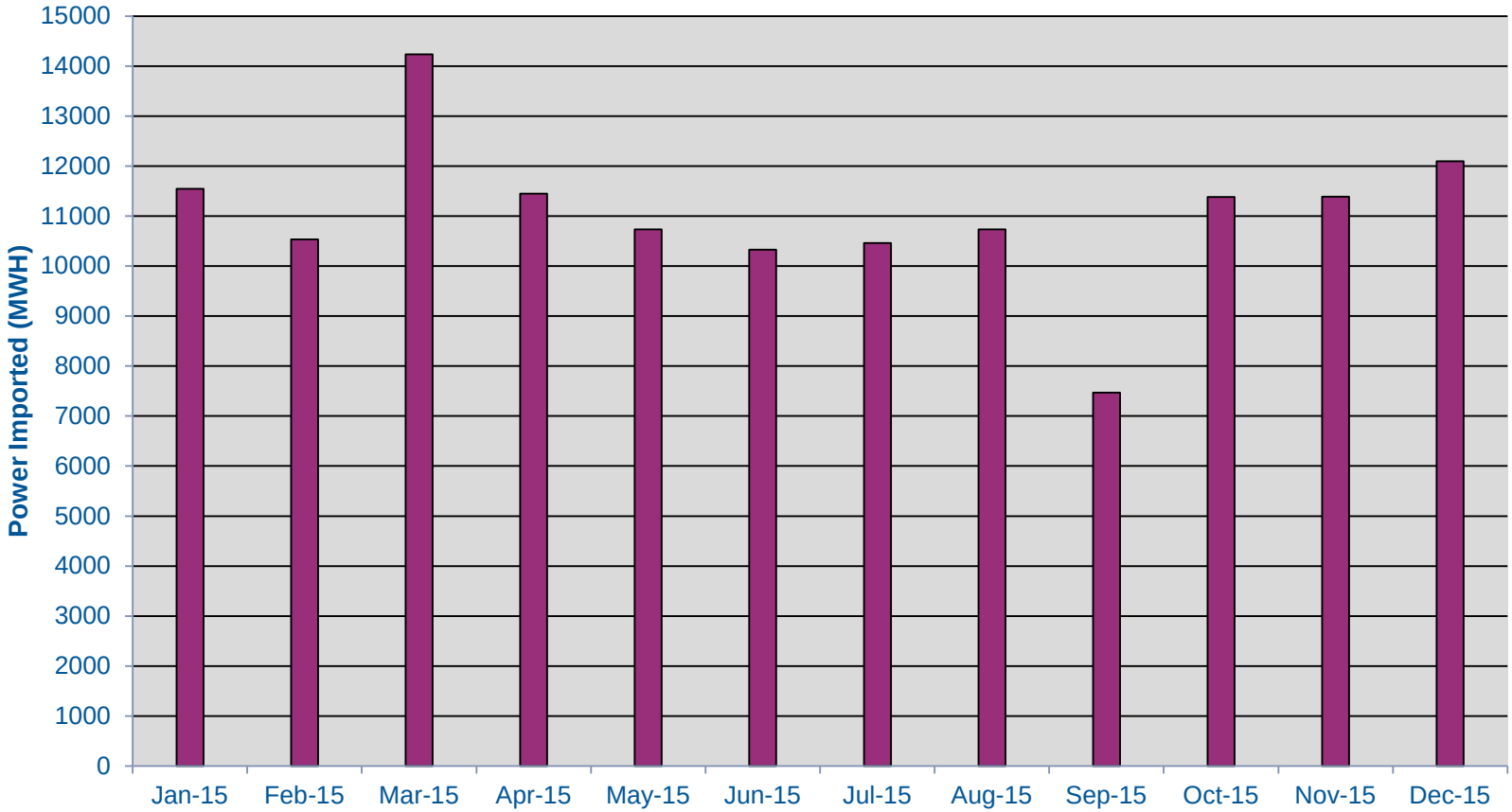
Steam Quality from Co-gen is maintained approximately 77% and OTSG is approximately 80%

Steam Generation (2016 YTD)



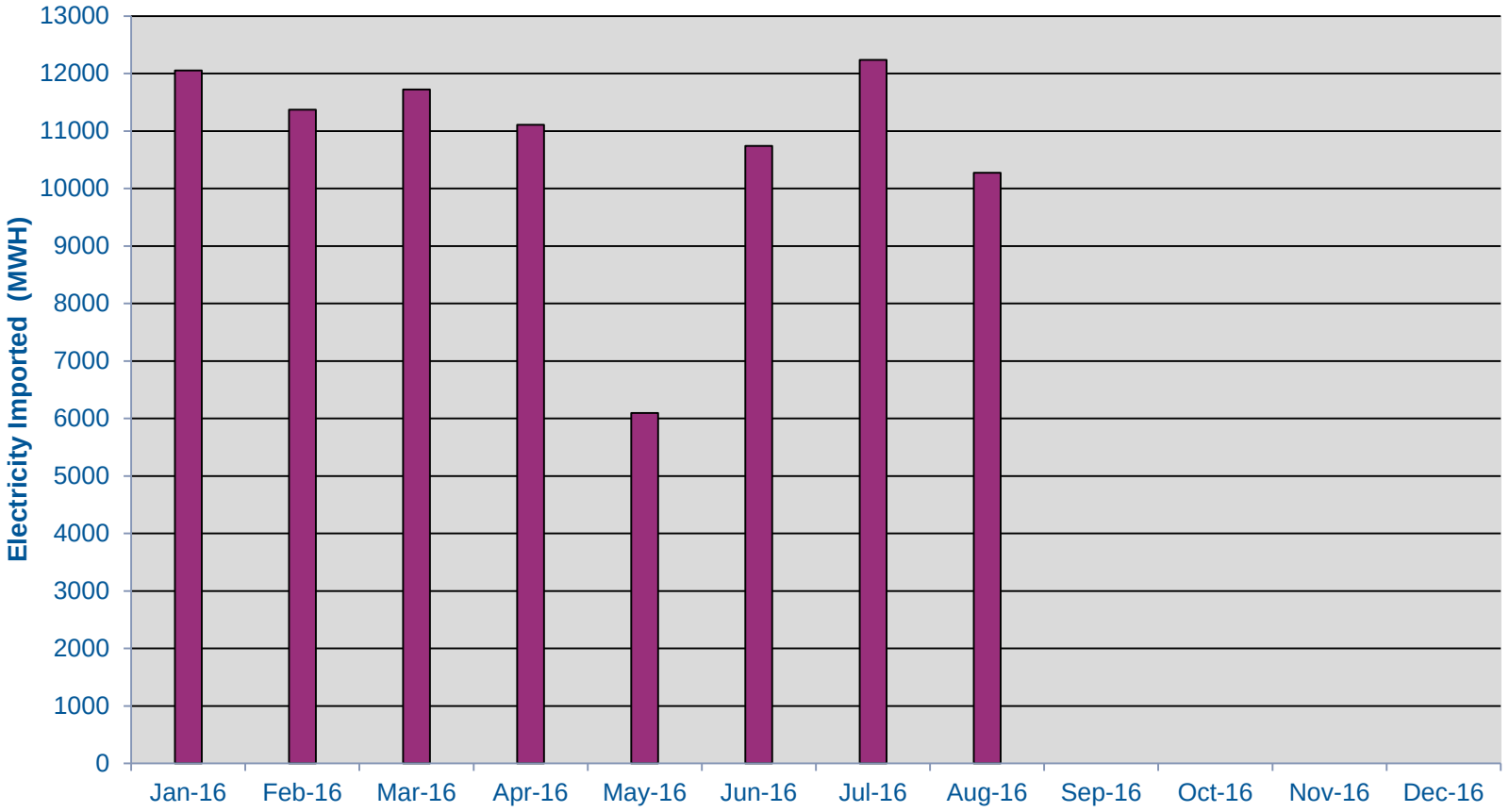
Steam Quality from Co-gen is maintained approximately 77% and OTSG is approximately 80%

Power Imported (2015)



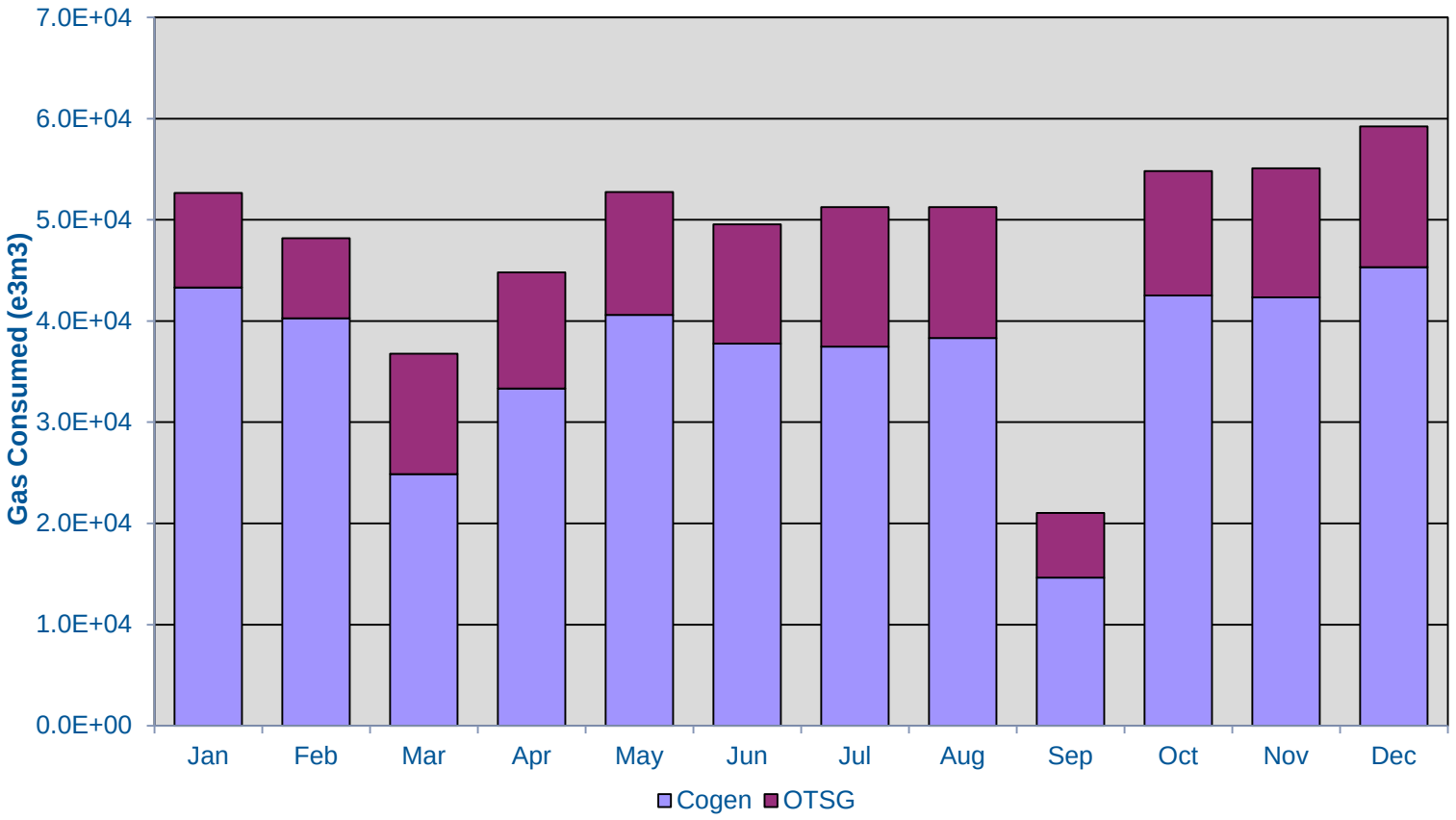
*Note: All power imported into Mackay River is consumed

Power Imported (2016 YTD)

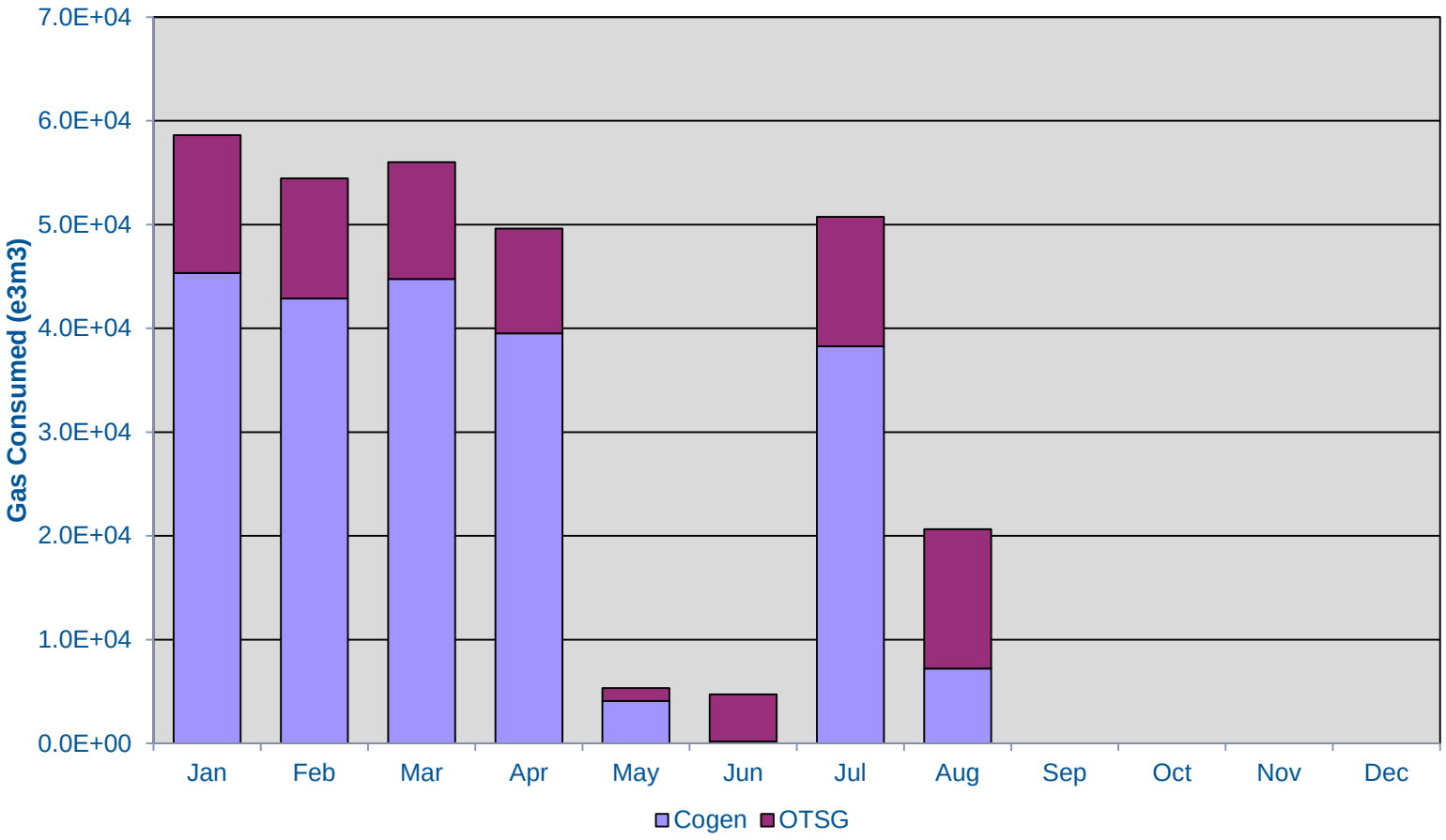


*Note: All power imported into Mackay River is consumed

Gas Consumption (2015)



Gas Consumption (2016 YTD)



Energy Intensity

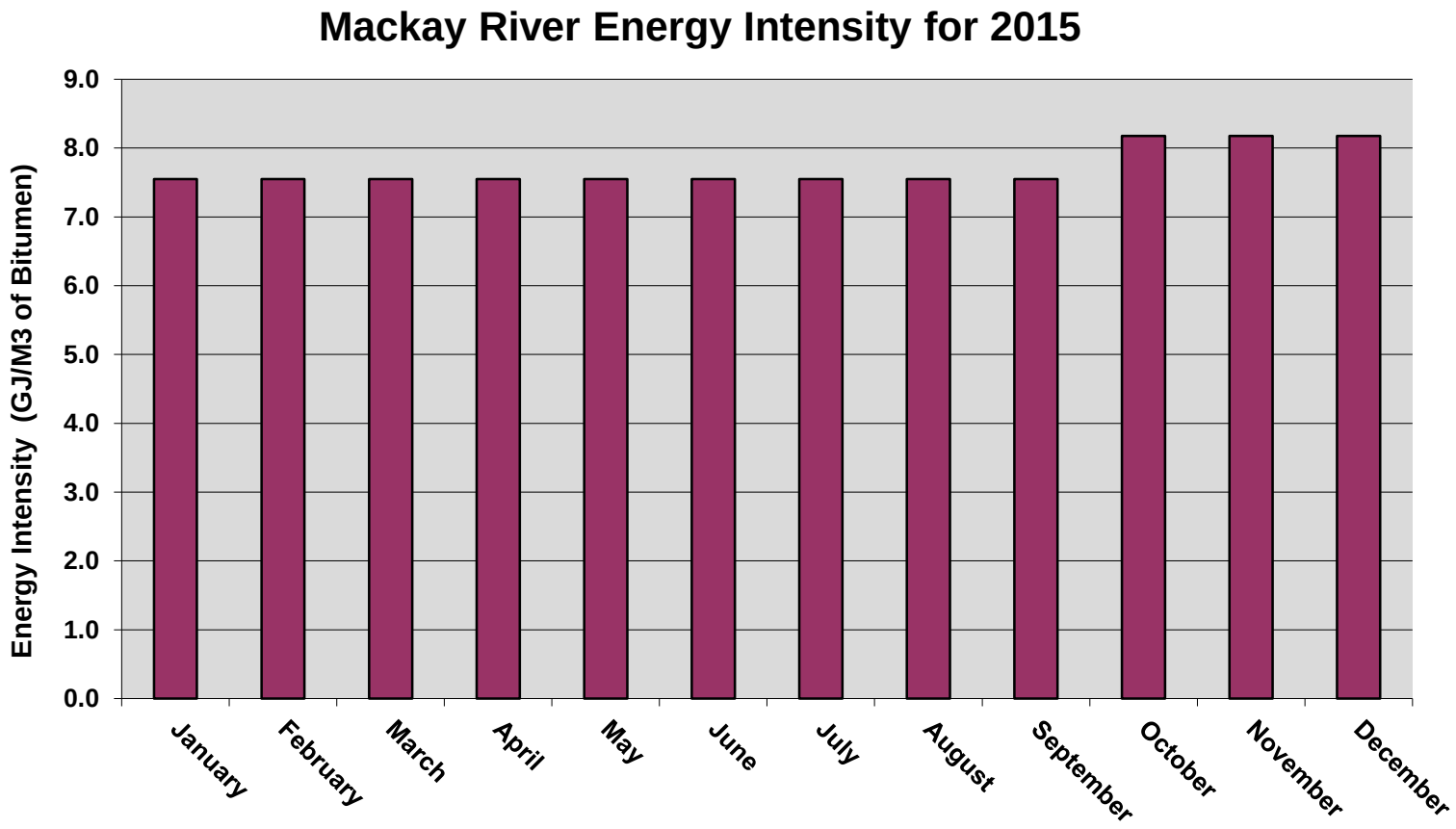
Energy Intensity Formula

- Energy Intensity (GJ/m^3) = Total energy consumed by site / Sales bitumen volume;
- Total energy consumed by site (GJ) = Energy used to make steam in Cogen + Natural Gas imported to site + Solution gas to Cogen + Electricity consumed by site – Mixed gas to Cogen duct firing:
  - Note that the term “site” does not include Cogeneration.
- Energy used to make steam in Cogen (GJ) = BFW Mass Flow Rate to Cogen x Hourly average difference in enthalpy between steam and BFW.

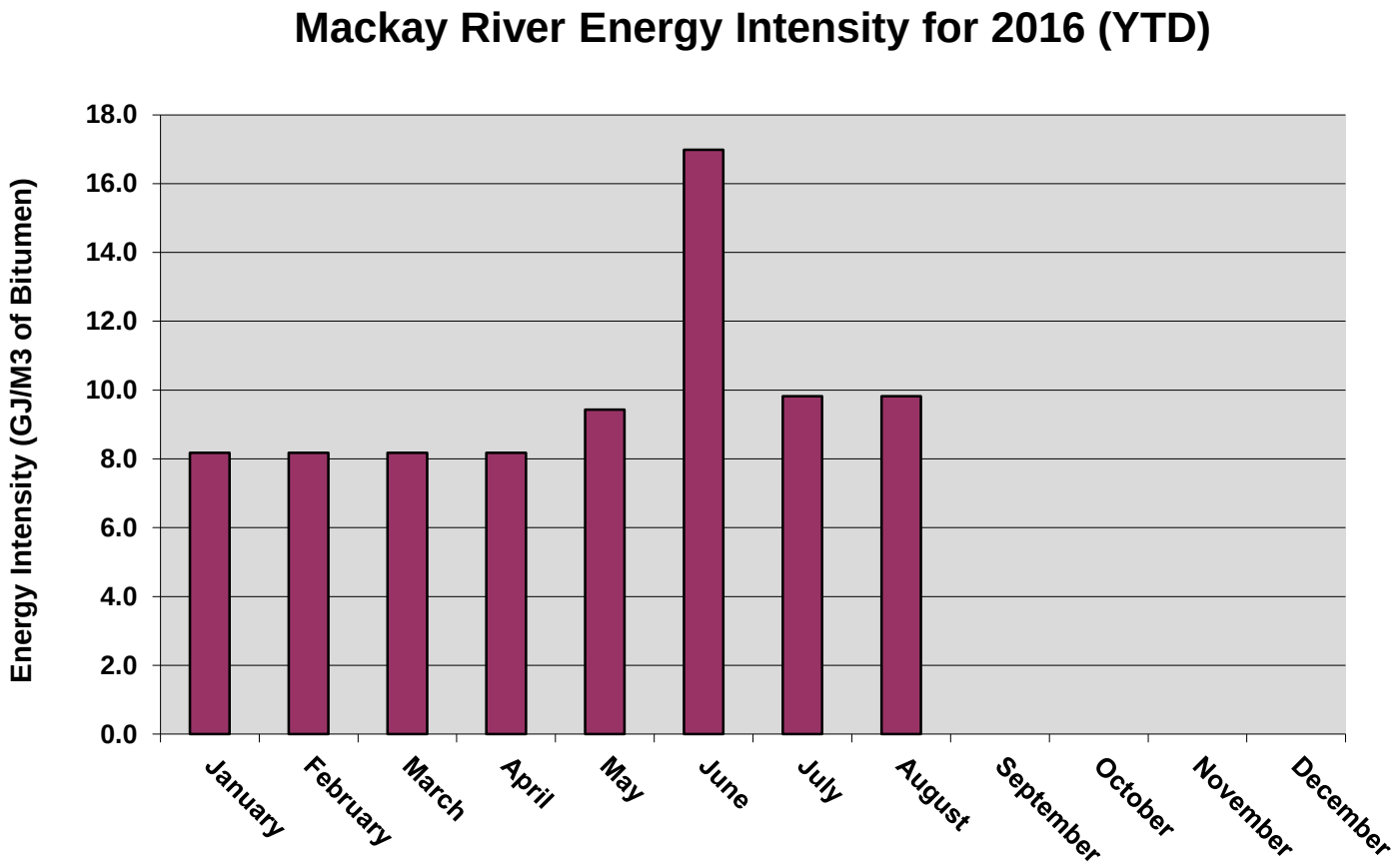
Cogeneration with TransCanada Energy

- Energy exchange: TransCanada Energy (TCE) provides steam and electricity to Suncor in exchange for BFW and a “fee”;
- A large portion of the steam used in the injection wells is recovered by Suncor as produced water. This produced water supplies most of the feedwater required for the HRSG.;
- A portion of the electrical power generated by the cogeneration plant is sold to Suncor for use onsite as well as at other offsite locations. In addition to the power contracted to Suncor, up to 150 MW of power is made available to Alberta consumers

Energy Intensity (2015)



Energy Intensity (2016 YTD)



MacKay River Performance Presentation

Measurement and Reporting

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Measurement Accounting & Reporting Plan (MARP)

- MARP provided to AER in April 2016 as part of the AER audit;
- AER performed MARP site audit in April 2016;
- Resubmitted MARP in August 2016 with amendments:
  - Updates from AER audit;
  - Removal of lift gas meters from produced water calculation;
  - Update of water balance.
- MacKay River Report Codes:
  - Battery – AB BT 0067097;
  - Injection Facility – AB IF 0009498;
  - Meter Station – AB MS 0084090.

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Well Testing Strategy

Test Separators are used to test all wells for production allocation:

- **Fully compliant with Directive 017.**

Pad 20 Well Testing Strategy:

- 13 active SAGD producers, 4-6 hour tests (+ purge time).

Pad 21 Well Testing Strategy:

- 12 active SAGD producers, 4.5 hour tests (+ purge time).

Pads 22 Well Testing Strategy:

- 23 active SAGD producers, 5.5 hour tests (+ purge time);
- No long grandfathered as a result of the Directive 017 update;
- Phase 4 (NN1 and QQ2-3) are tested via Pad 22 Test Separator;
- Phase 5A (NN2-5, QQ4-5) are tested via Pad 22 Test Separator.

Pads 23/24 Well Testing Strategy:

- 14 active SAGD producers, 7-7.5 hour tests (+ purge time);
- Pad 24 Phase 4 (OO1-3) are tested via Pad 23 Test Separator;
- Pad 24 (H1-4) are tested via Pad 23 Test Separator.

Pad 25 Well Testing Strategy:

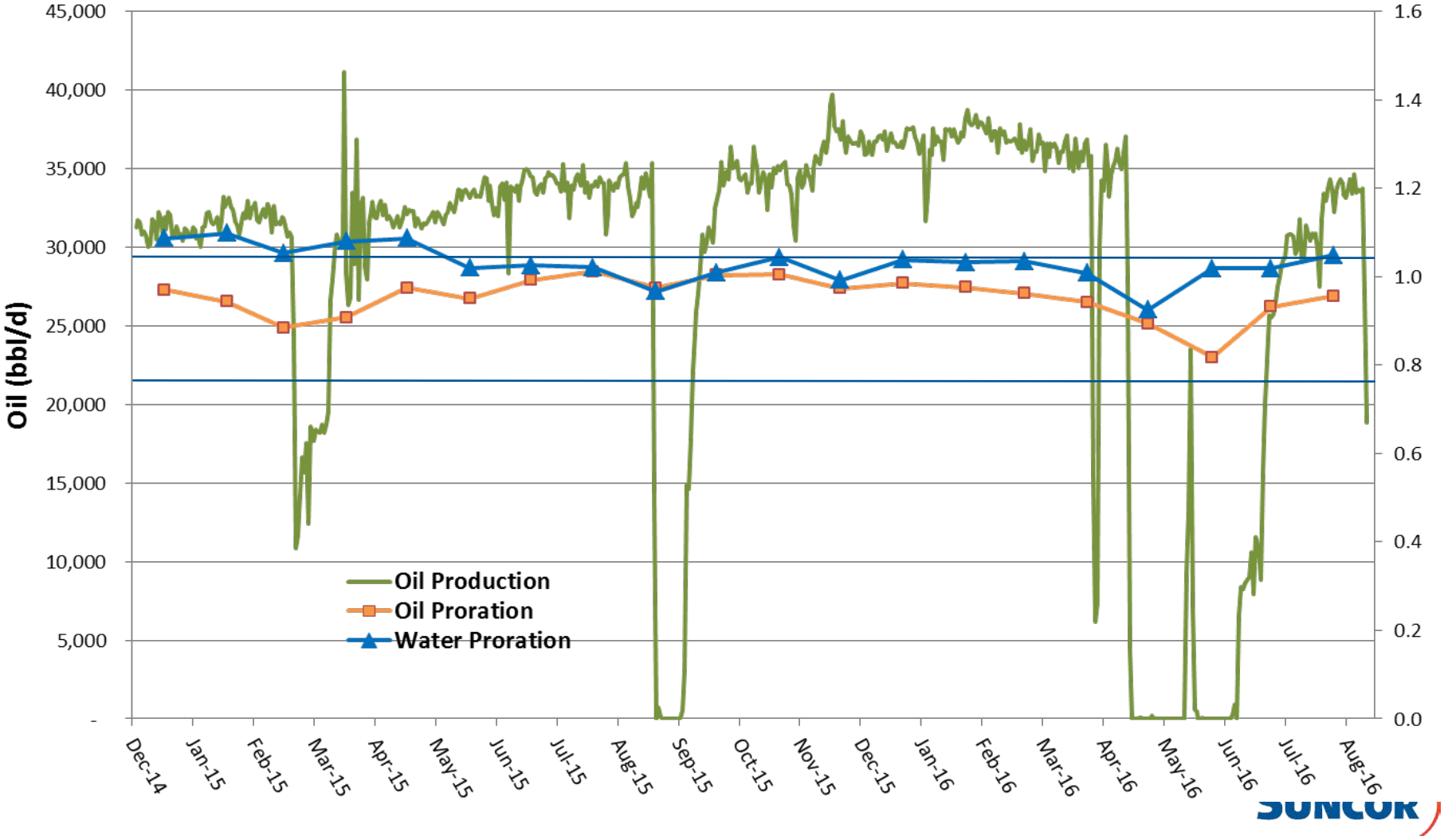
- V-100 Test Separator:
  - 10 active SAGD producers, 5 hour tests (+ purge time).
- V-1100 Test Separator:
  - *12 active SAGD producers,* 5 hour tests (+ purge time).
- V-1150 Test Separator:
  - *12 active SAGD producers*, 6 hours test (+ purge time):
  - Pad 24 Phase 5B1 (OO4-9) are tested via V-1150;
  - Pad 24 Phase 5DF (OO10-15) are tested via V-1150.

Pads 824 Well Testing Strategy:

- 2 active SAGD producers, 7 hour tests (+ purge time);
- Wells are tested via Vx Meter.

Proration of Oil and Water

- Average for 2015: Oil Factor = 0.97 Water Factor = 1.04



MacKay River Performance Presentation

Water Production, Injection and Use

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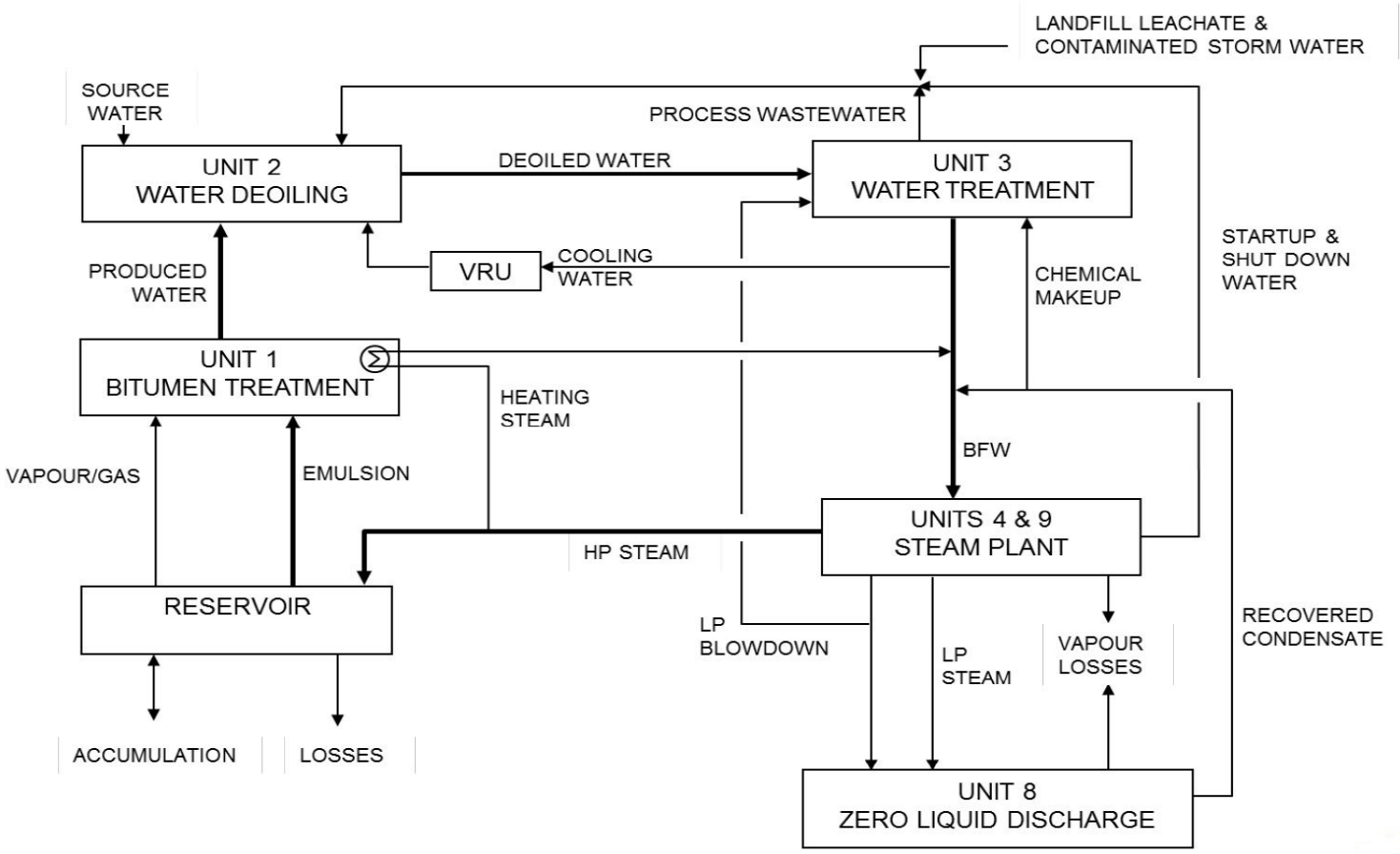
CPF Water Traffic



Fresh Water

Source Water Wells

- *Water Act* Licence No. 00188229-02-00 (511,000 m^3/year) Birch Channel Aquifer (Renewal issued September 2012):

1. 13-05-093-12W4 (GD-SW-212-53; formerly WSW-1), max. rate 450 m^3/day;
2. 04-08-093-12W4 (GD-SW-213-86; formerly WSW-2), max. rate 1368 m^3/day;
3. 04-08-093-12W4 (GD-SW-215-91; formerly WSW-3), max. rate 1411 m^3/day.

Domestic Water Well:

- *Water Act* Licence No. 00249470-01-00 (25,550 m3/y) Birch Channel Aquifer (Currently not in use):

4. 12-05-093-12W4 (CWSW-SW-218-55), max. rate 123 m3/day.

Monthly reporting for Source Water Wells and Domestic Water Well is done through Water Use Reporting System (WURS).

Raw Water Source Wells

Test	Parameter	Water Analysis Result (5-Oct-15)
Physical	EC (uS/cm)	855
	pH (units)	8.32
	Tot Hard as CaCo2 (mg/L)	398
	Tot Alk as CaCO3 (mg/L)	363
Indicators	Chloride:D (mg/L)	<0.5
	Sulphate:D (mg/L)	111
	Iron:D (mg/L)	3.75
	Manganese:D (mg/L)	0.265
	TDS-calculated (mg/L)	504
cations, anions, and ion balance	Calcium:D (mg/L)	105
	Magnesium:D (mg/L)	33
	Potassium:D (mg/L)	5.36
	Sodium:D (mg/L)	31.8
	Bicarbonate:D (mg/L)	363
	Carbonate:D (mg/L)	<5
	Hydroxide:D (mg/L)	<5
	Fluoride:D (mg/L)	0.205
	Ion balance % (%)	99.7
nitrogen parameters	NO2 as N (mg/L)	<0.01
	NO3 and N (mg/L)	<0.02
	NO2 + NO3 as N (mg/L)	<0.022
	DKN (mg/L)	-
	TKN (mg/L)	-
	Tot Amm N (mg/L)	-
phenols	phenols (mg/L)	-
PAH	Naphthenic Acids (mg/L)	-

Typical water quality assessment parameters;

Monitoring station GD-SW-212-53 (formerly WSW-1);

Results shown are from October 5, 2015 sampling program.

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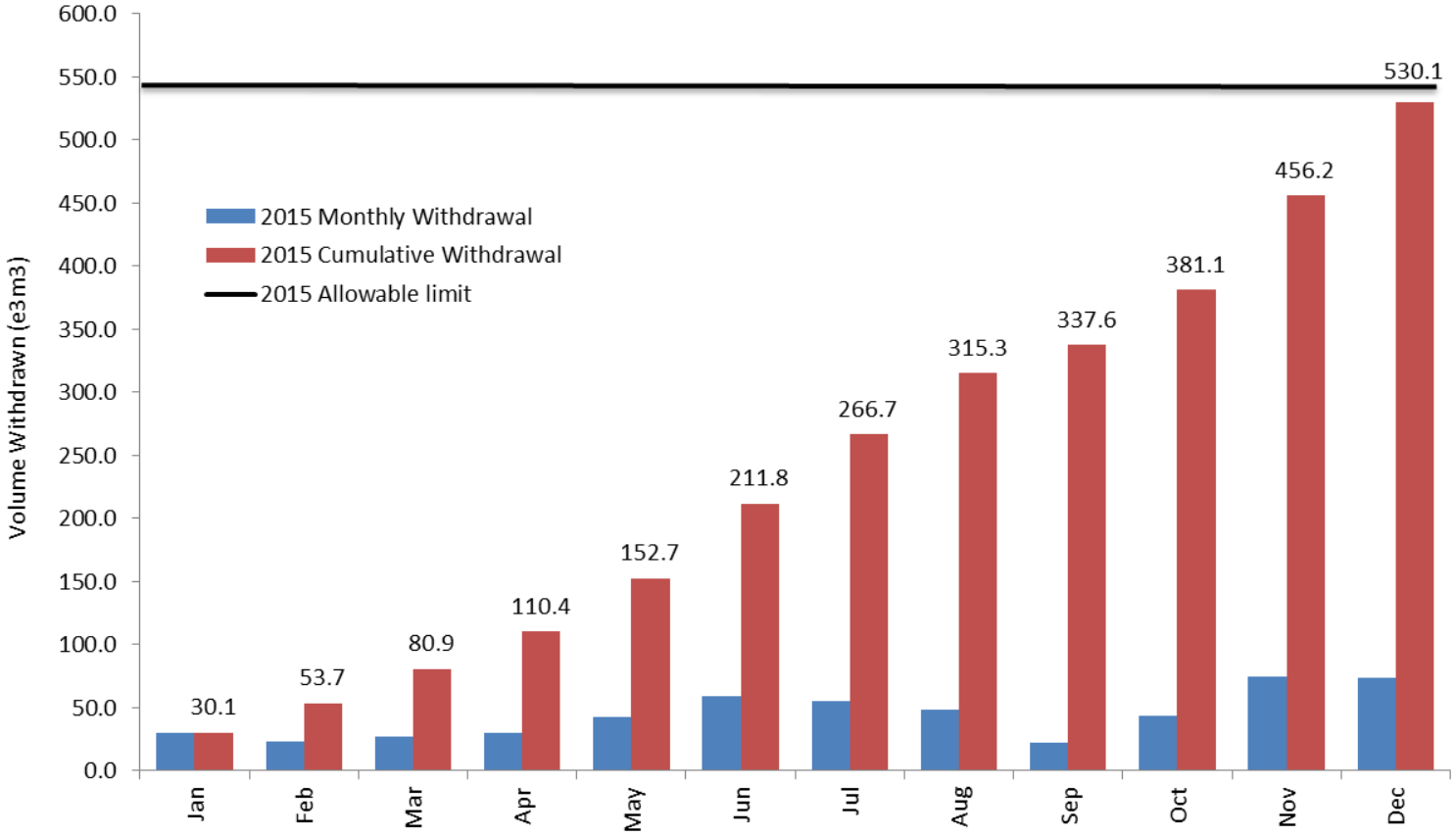
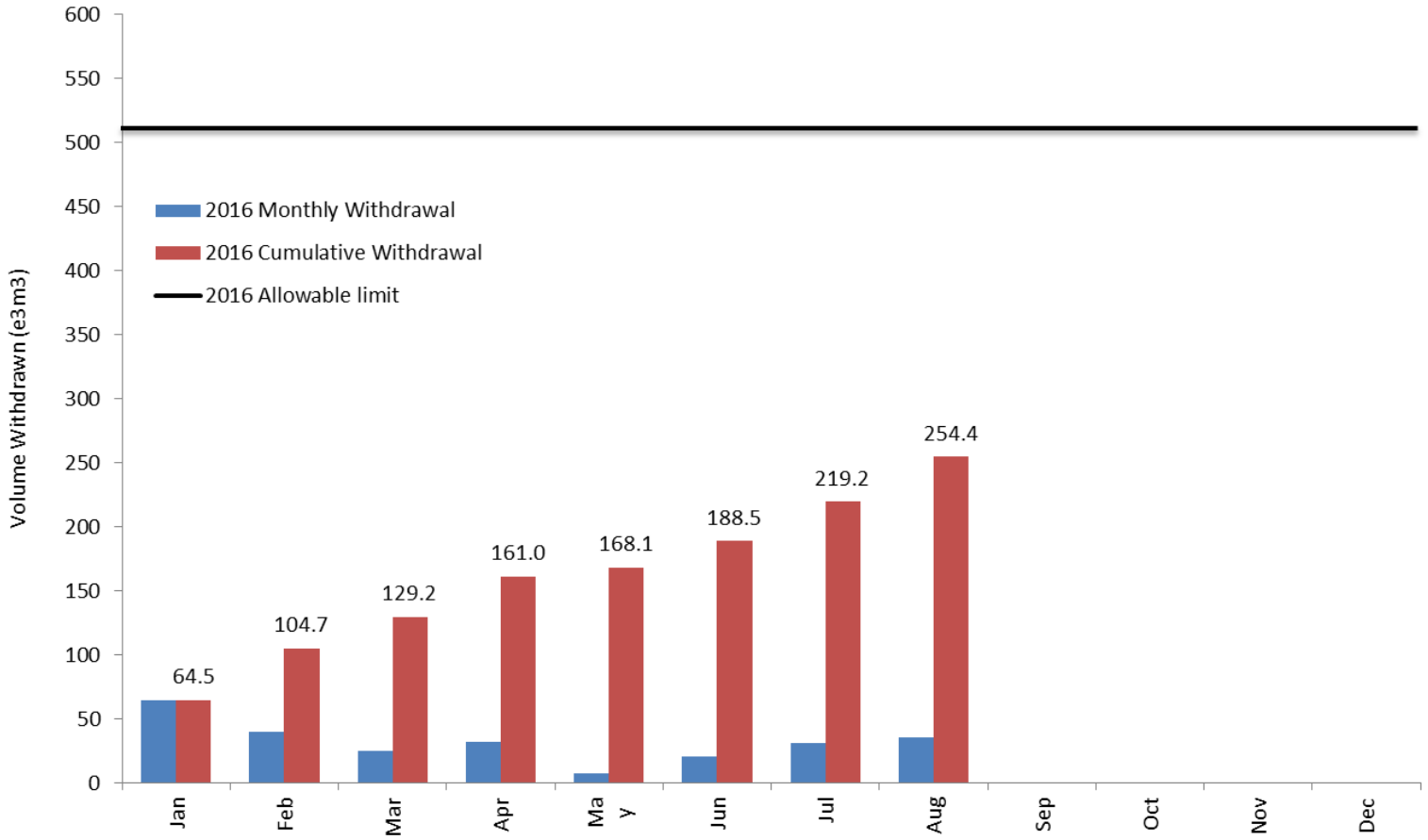
Raw Water Withdrawal – Source Wells (2015)



- Regulatory allowable limit from *Water Act* Licence No. 188229 is 511e^{3}m^3 per year;
- A temporary diversion license (TDL No. 375567) allowed Suncor to divert an additional 32.29e^{3}m^3 between Dec 1-31, 2015;
- The total diversion limit of 543.29e^{3}m^3 per year is shown (black line).

Raw Water Withdrawal – Source Wells (2016 YTD)



- Regulatory allowable limit from *Water Act* Licence No. 188229 is 511e^{3}m^3 per year

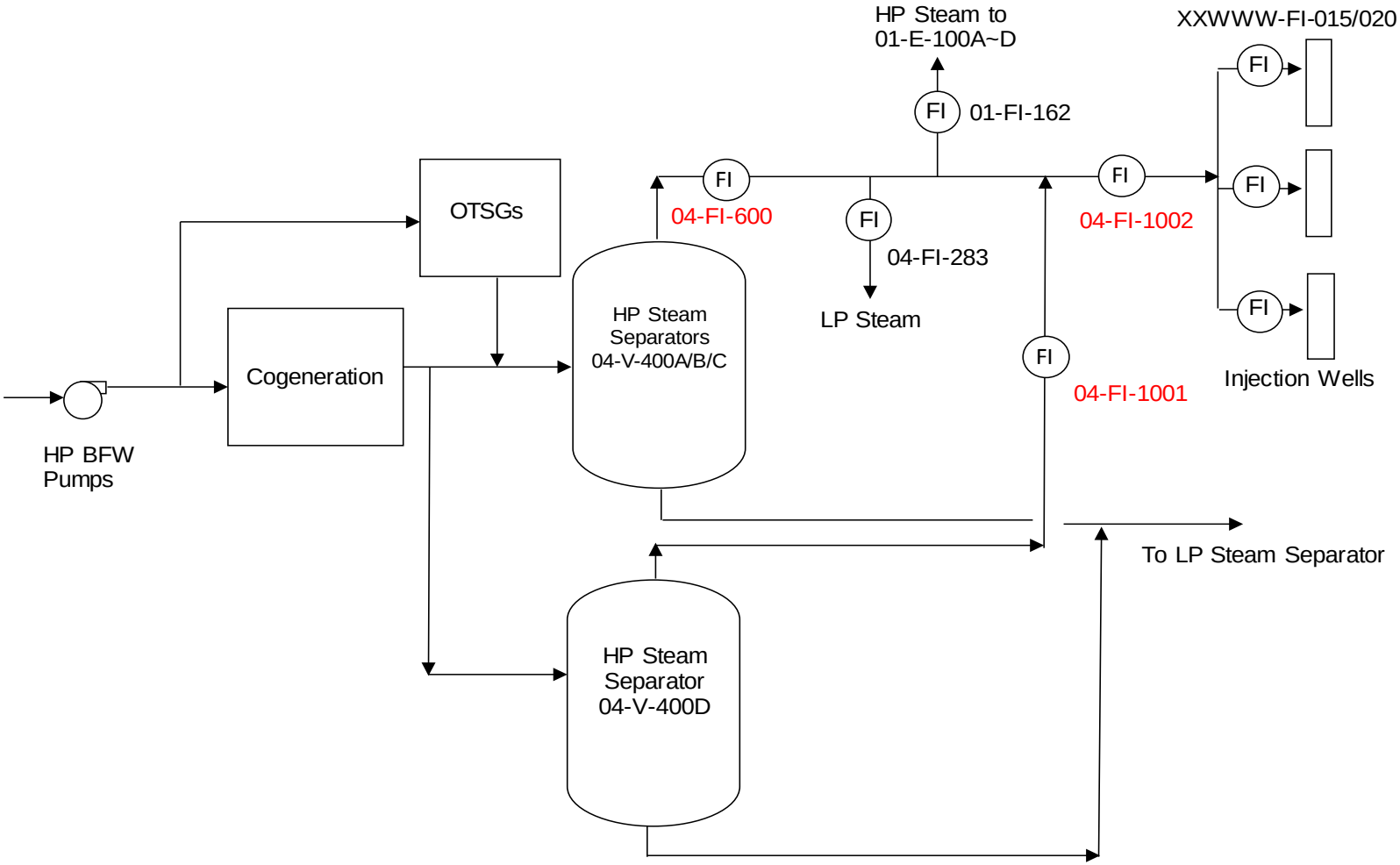
Raw Water Withdrawal – Domestic Well (2016)

- Water well casing failure on September 9, 2011; well was abandoned and a replacement well drilled July 2013;
- No water has been withdrawn from this well (2016 YTD).

Water Balance

- **Steam**:
  - Primary produced steam:
    - New annubar steam meter (04-FI-1002) plus liquid carryover:
      - Installed during the September 2015 turnaround on the common steam header to the pads;
      - Carryover volume quantified through TDS analysis.
  - Secondary produced steam:
    - Sum of steam meters from steam separators (04-FI-600, 04-FI-1001) minus steam sent to production heaters (01-FI-162) and any steam vented (04-FI-283).

Water Balance Continued



Water Balance Continued

- **Raw Water** = Σ Water Source wells (3 water source wells);
- **Accumulation** = Closing Inventory – Opening Inventory;
- **Produced Water** = Produced water to WLS + Accumulation – Others:
  - Produced Water to WLS = 02-FI-500 + 02-FI-306;
  - Others include: Raw water, BLD Recycle, BFW to VRU.
- Details of measurement and reporting procedures may be found in the MARP;
- Water from the crystallizer is metered at the crystallizer outlet before it goes to the dryer:
  - Truck tickets capture the volume of water trucked off-site;
  - Volumes reported in Petrinex.

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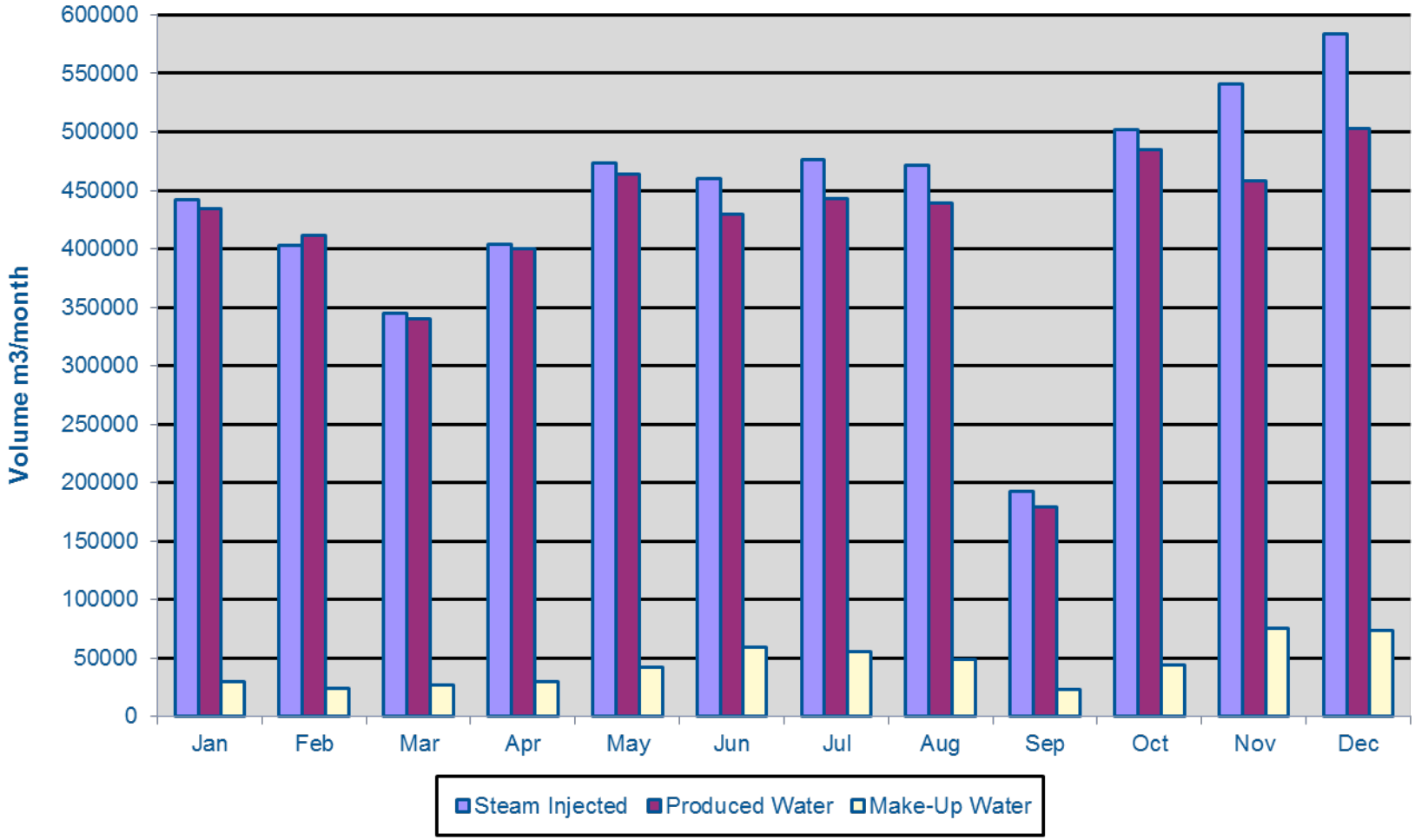
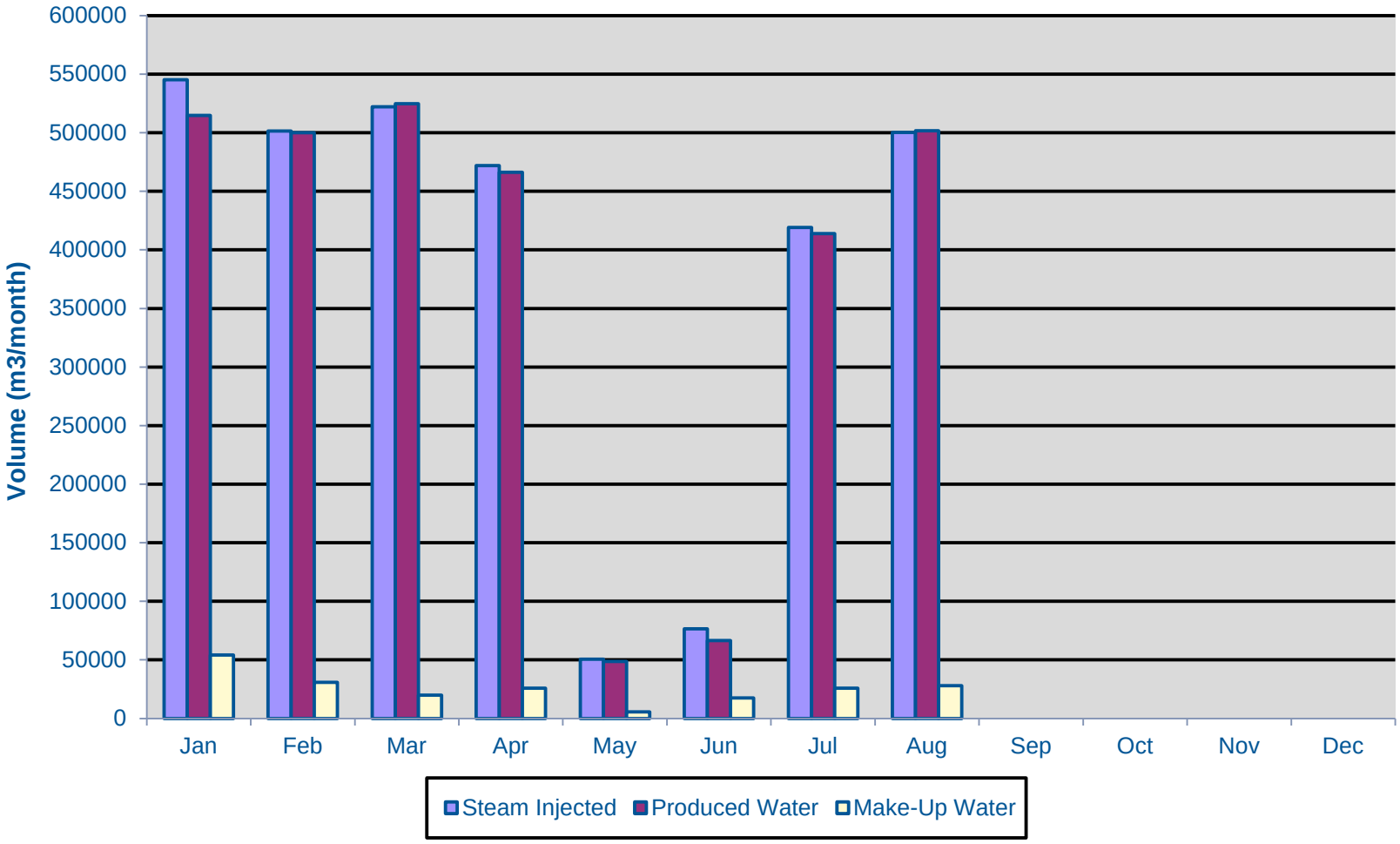
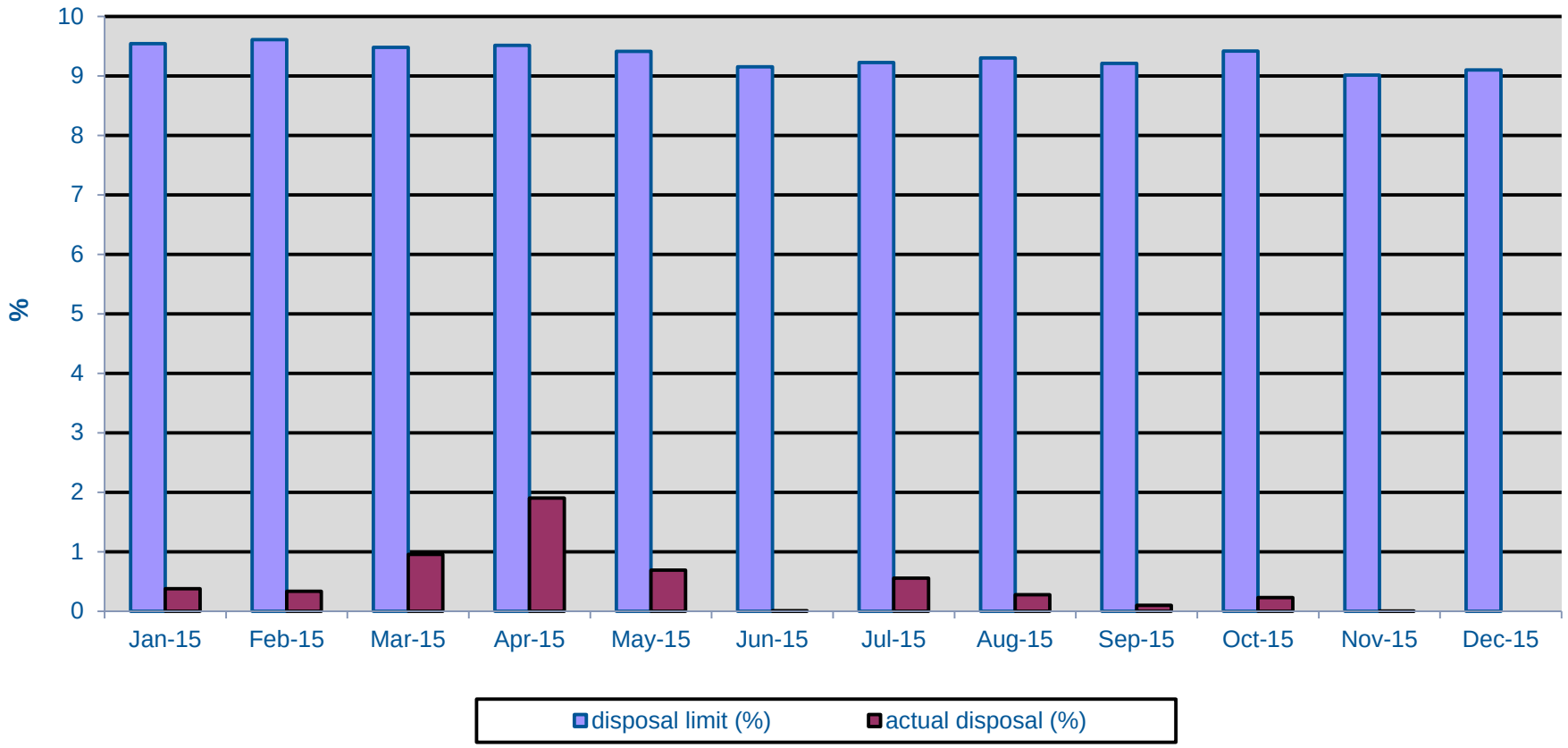
Water Balance (2015)



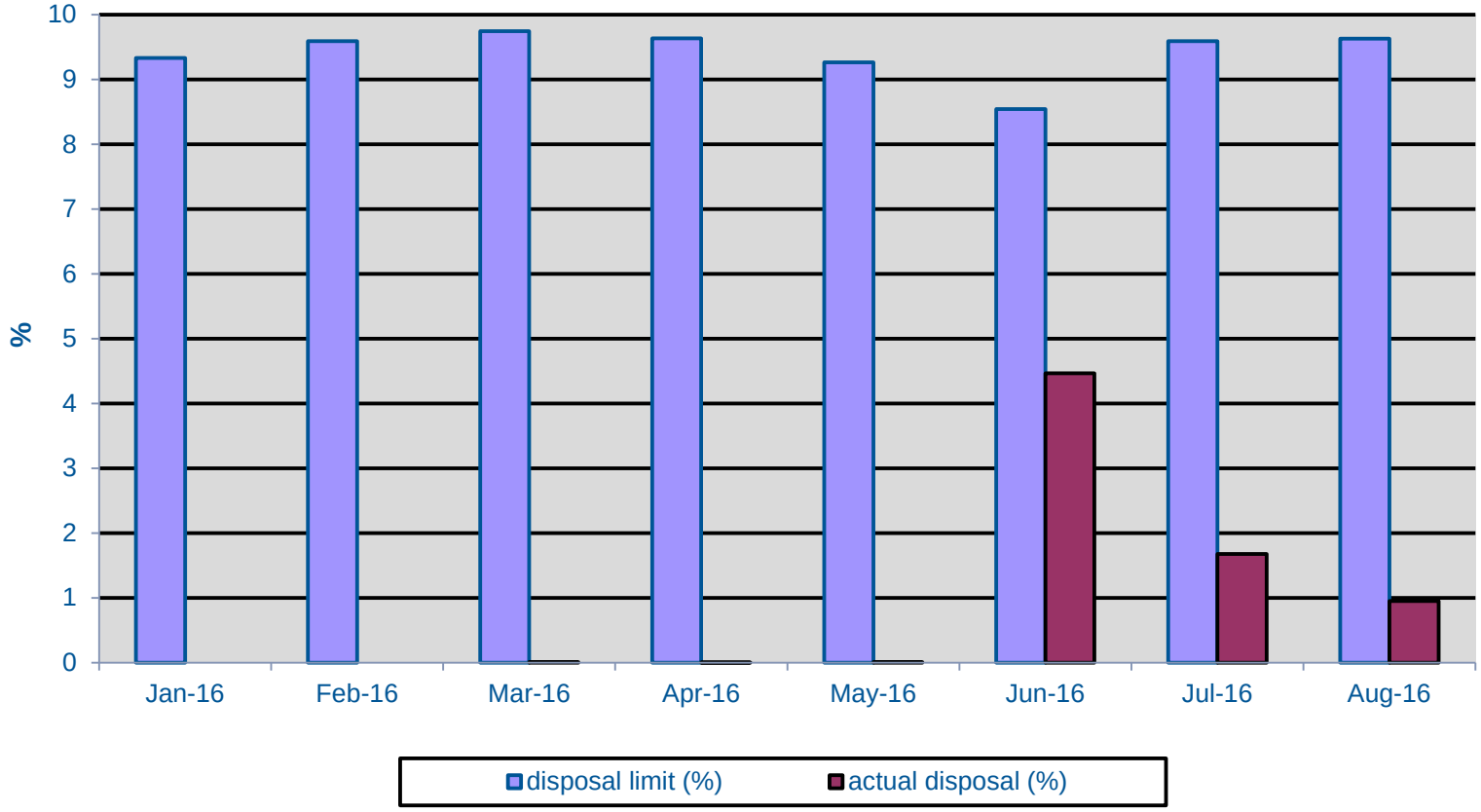
Water Balance (2016 YTD)



Water Disposal % (2015)



Water Disposal % (2016 YTD)



Low Pressure Blowdown Recycle (2015 & 2016 YTD)

Blowdown Recycle = 100%:

- Blowdown treated in the Water Plant:
  - YTD: 43,670 m^3/month (Lower as a result of plant shutdowns due to wildfires) 2015: 54,741 m^3/month.
- Blowdown treated in the Zero Liquid Discharge (ZLD) Plant:
  - YTD: 31,220 m^3/month (Lower as a result of plant shutdowns due to wildfires) 2015: 39,459 m^3/month.

Trucked volumes from Diversion Lagoon:

- 55,816 m^3 (January 1,2014 – December 31, 2014);
- 23,979 m^3 (January 1, 2015 – December 31, 2015);
- 16,199 m^3 (January 1,2016 – August 31, 2016).

Note: The diversion lagoon is filled by crystallizer concentrate during purges *and* by landfill leachate after periods of rain.

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MacKay River Landfill / Waste Management

AER Approval WM-072 Class II Oilfield Landfill:

- Volumes of solids (salt/lime) to landfill:
  - 2015: 28,019 m^3
  - 2016 YTD : 11,366* m^3 .
- Total volume of landfill fluids to facility :
  - 2015: 14,465 m^3
  - 2016 YTD:17,362* m^3.
- Waste Surveys Total Volumes:
  - Phase III West: 46,139 m^3
    - (Survey completed on July 7, 2016).
  - Phase III East: no material placed to date:
  - Phase II Cell (A&B): 74,270 m^3
    - (Survey completed February 6/8, 2015).
  - Phase I of the MacKay River Landfill is closed and is in post-closure monitoring period.
- Waste services contract in place:
  - Addresses hazardous, scrap metal, domestic waste.
- Waste Tracker software used to track and submit manifests to AER.

*Volumes estimated in August 2016

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Off-Site Brine Water Disposal

Location of disposal site:

- Absolute Environmental Waste;
- 11-17-53-23-W4M.

- Brine water is disposed of off-site when the diversion tank and diversion lagoon reach capacity and the ZLD system cannot process the boiler blowdown from Unit 400.

- Water sources in the diversion lagoon include: precipitation, leachate from the MacKay River Landfill and excess boiler blowdown water during upset conditions.

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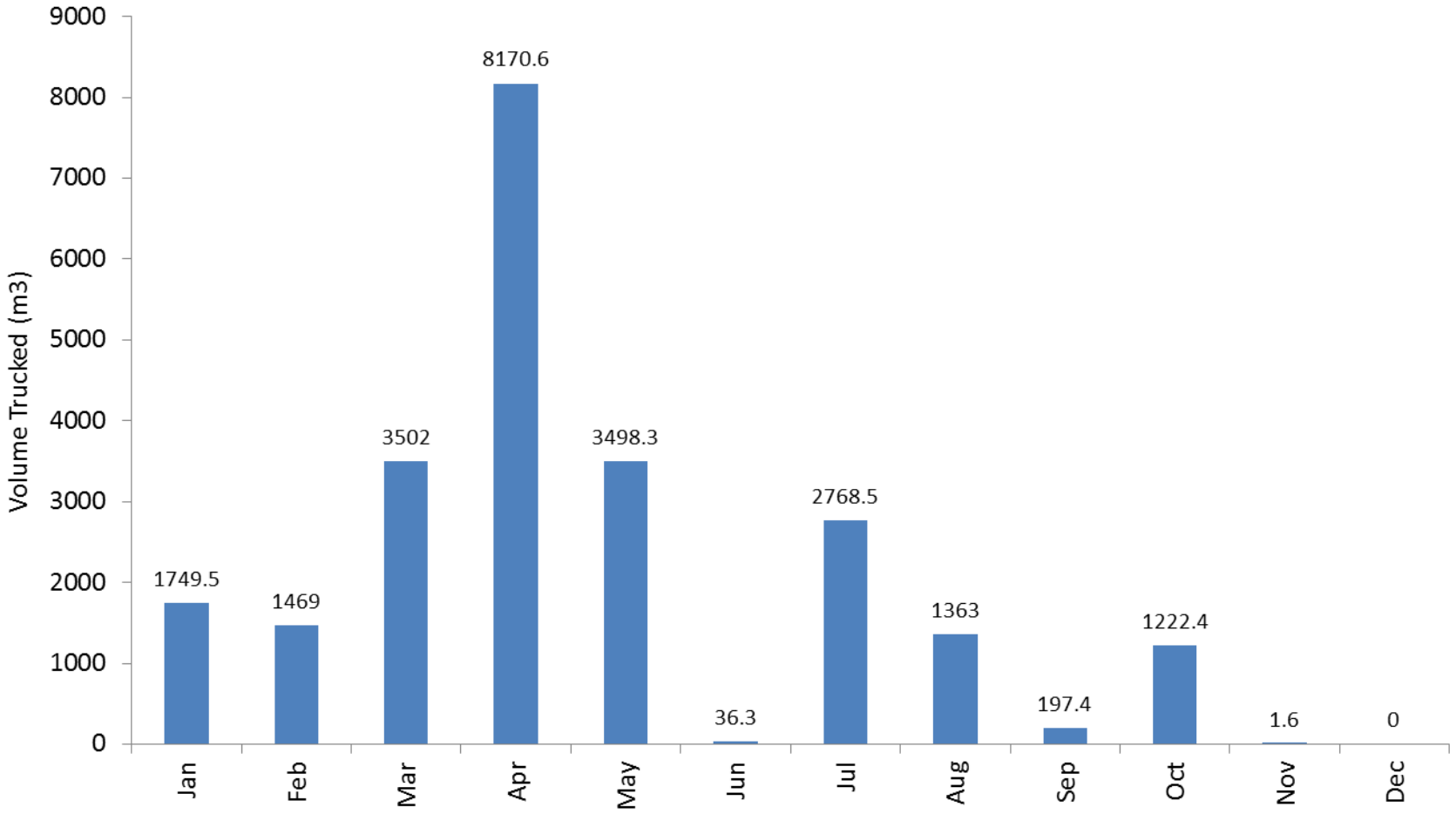
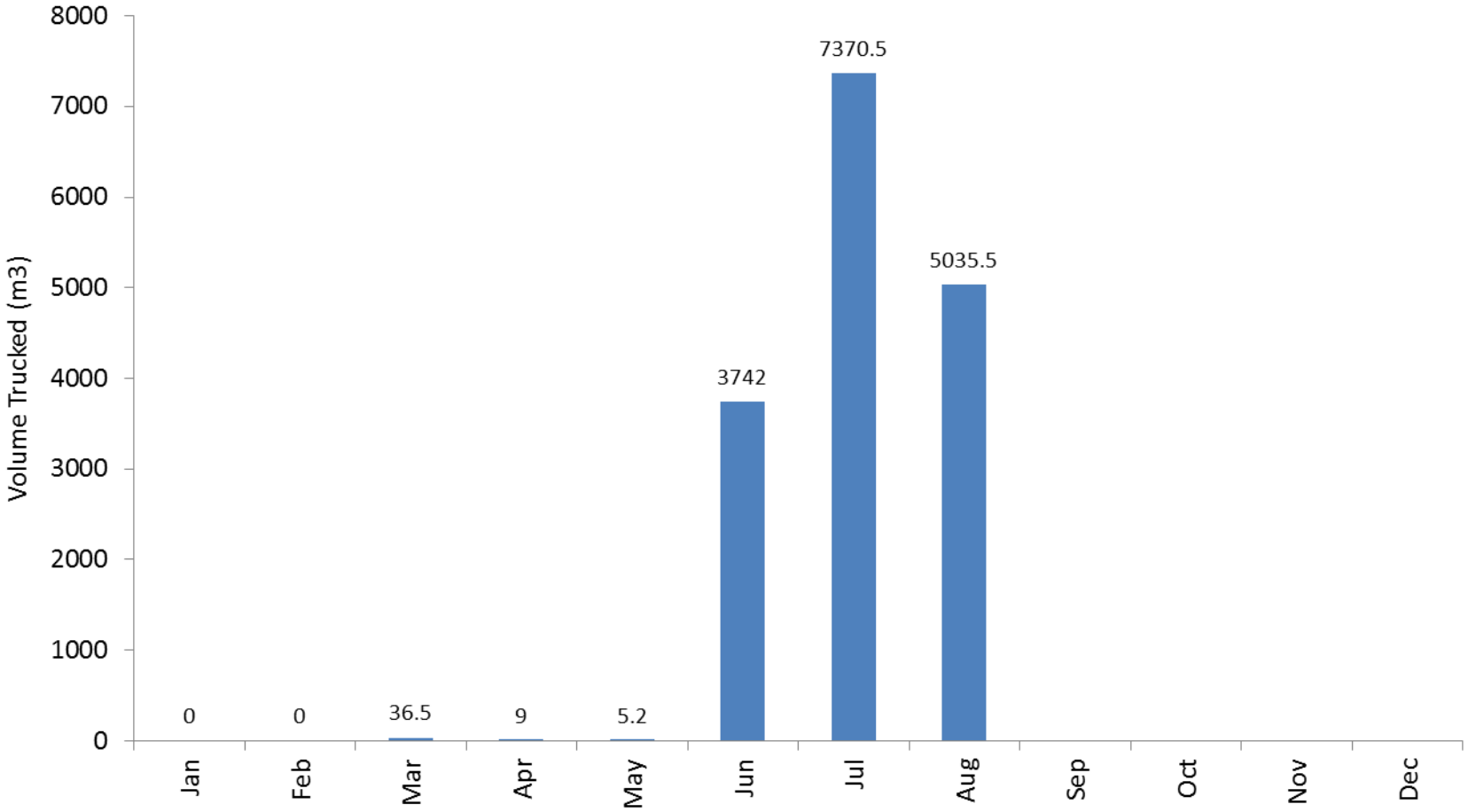
Off-Site Brine Water Disposal (2015)



- Volumes reported via Petrinex

Off-Site Brine Water Disposal (2016 YTD)



- Volumes reported via Petrinex

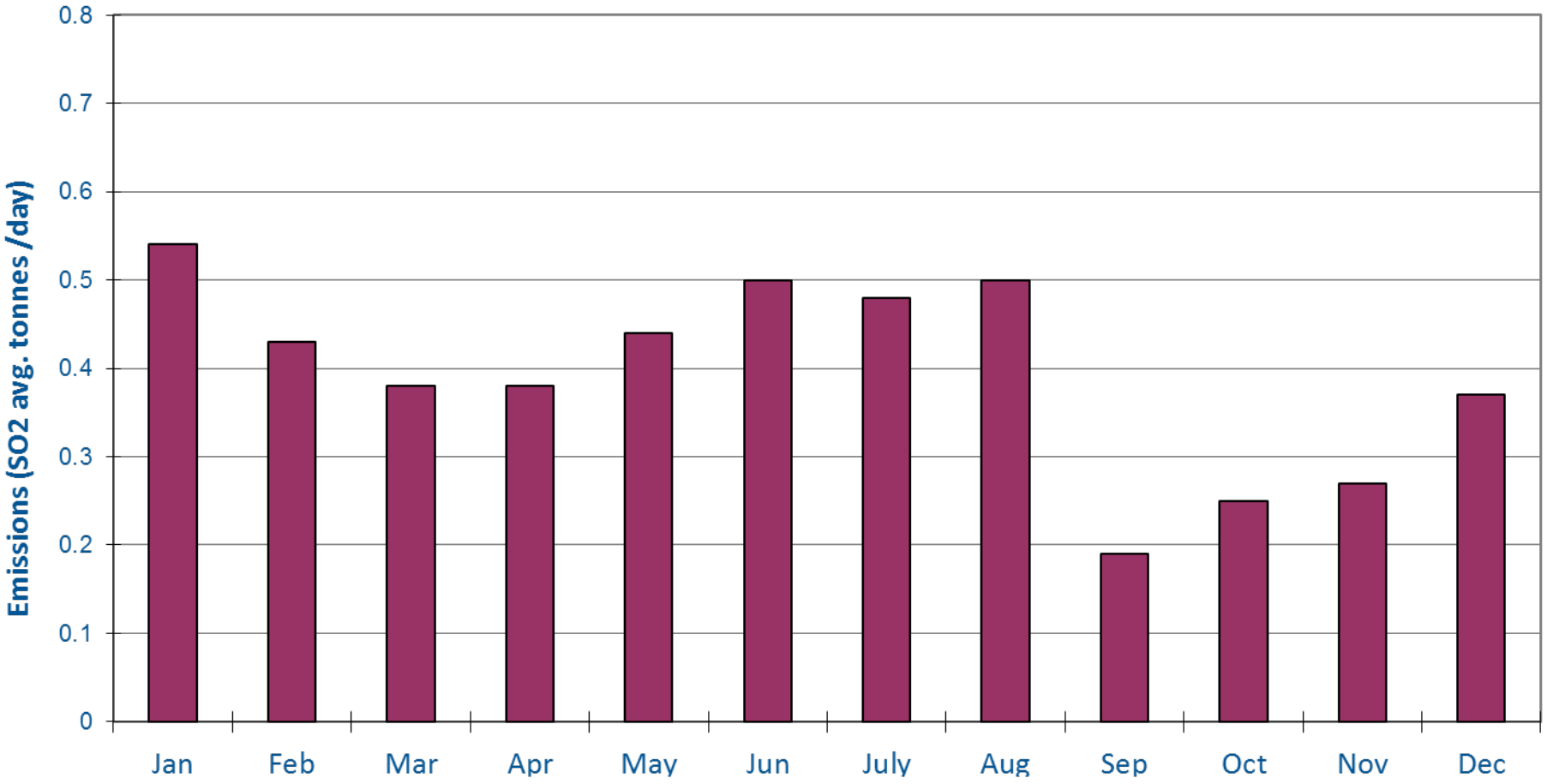
MacKay River Performance Presentation

Sulphur Production

Sulphur Production

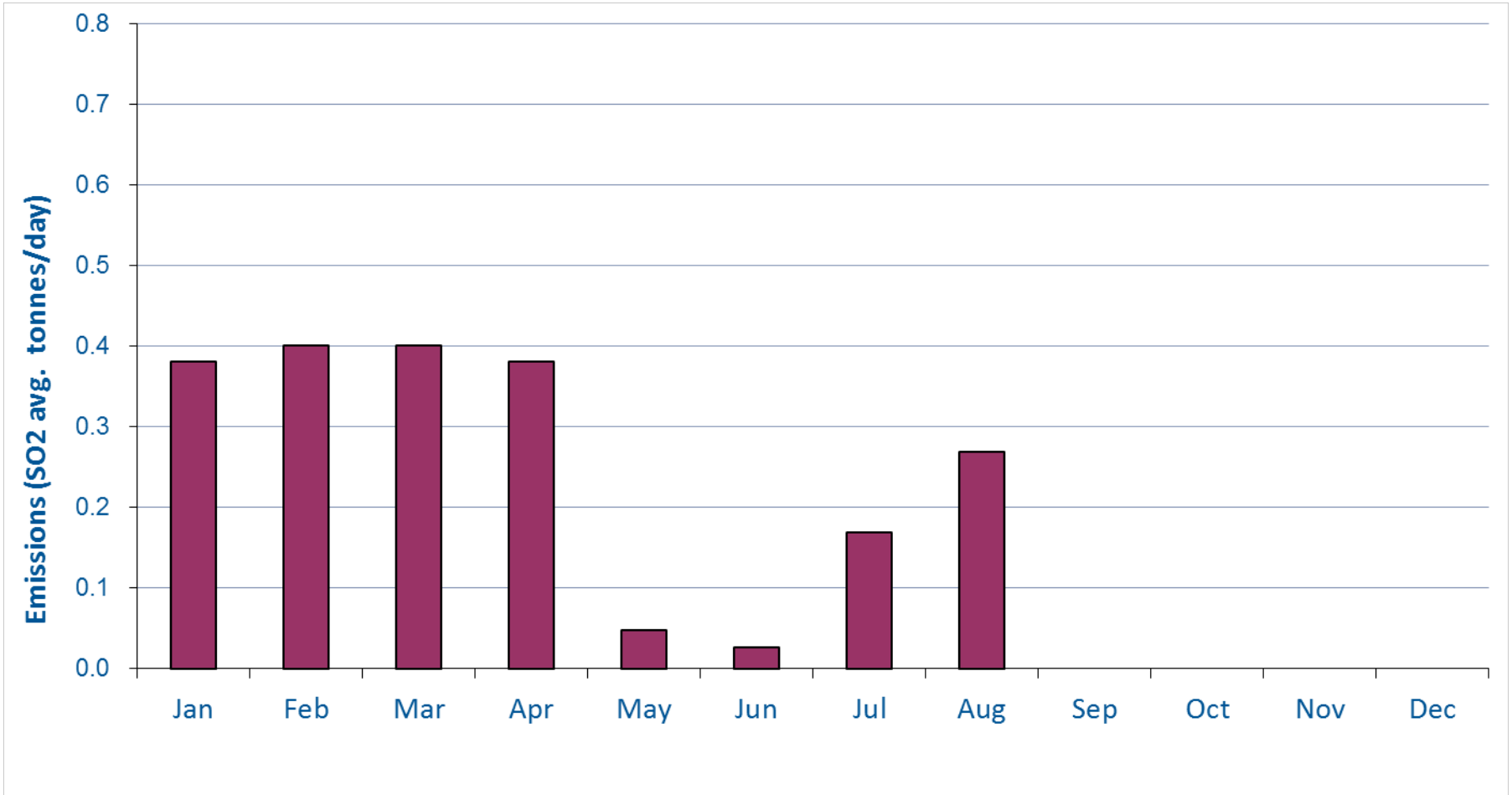
- Currently there are no sulphur recovery facilities at the MacKay River Project;
- All produced sulphur is burnt in the overall process;
- Present trends indicate an SRU will not be required for the Project;
- Suncor will continue to monitor the sulphur trends.

Sulphur Dioxide Emissions (2015)



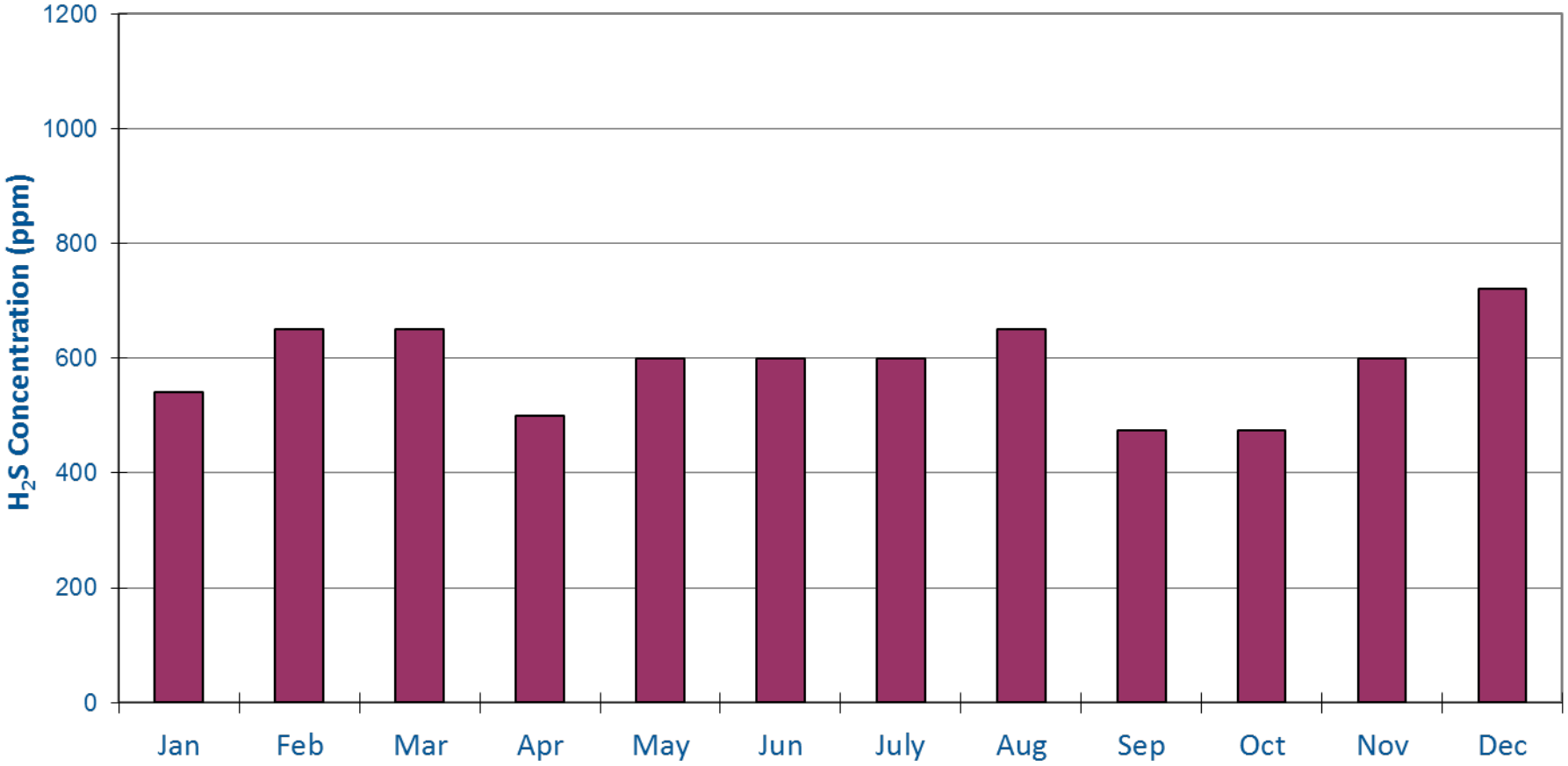
- SO_2 emissions are calculated from monthly produced gas samples

Sulphur Dioxide Emissions (2016 YTD)



- SO_2 emissions are calculated from monthly produced gas samples

H_2S Concentration (2015)



- H_2S concentrations are measured in monthly produced gas samples.

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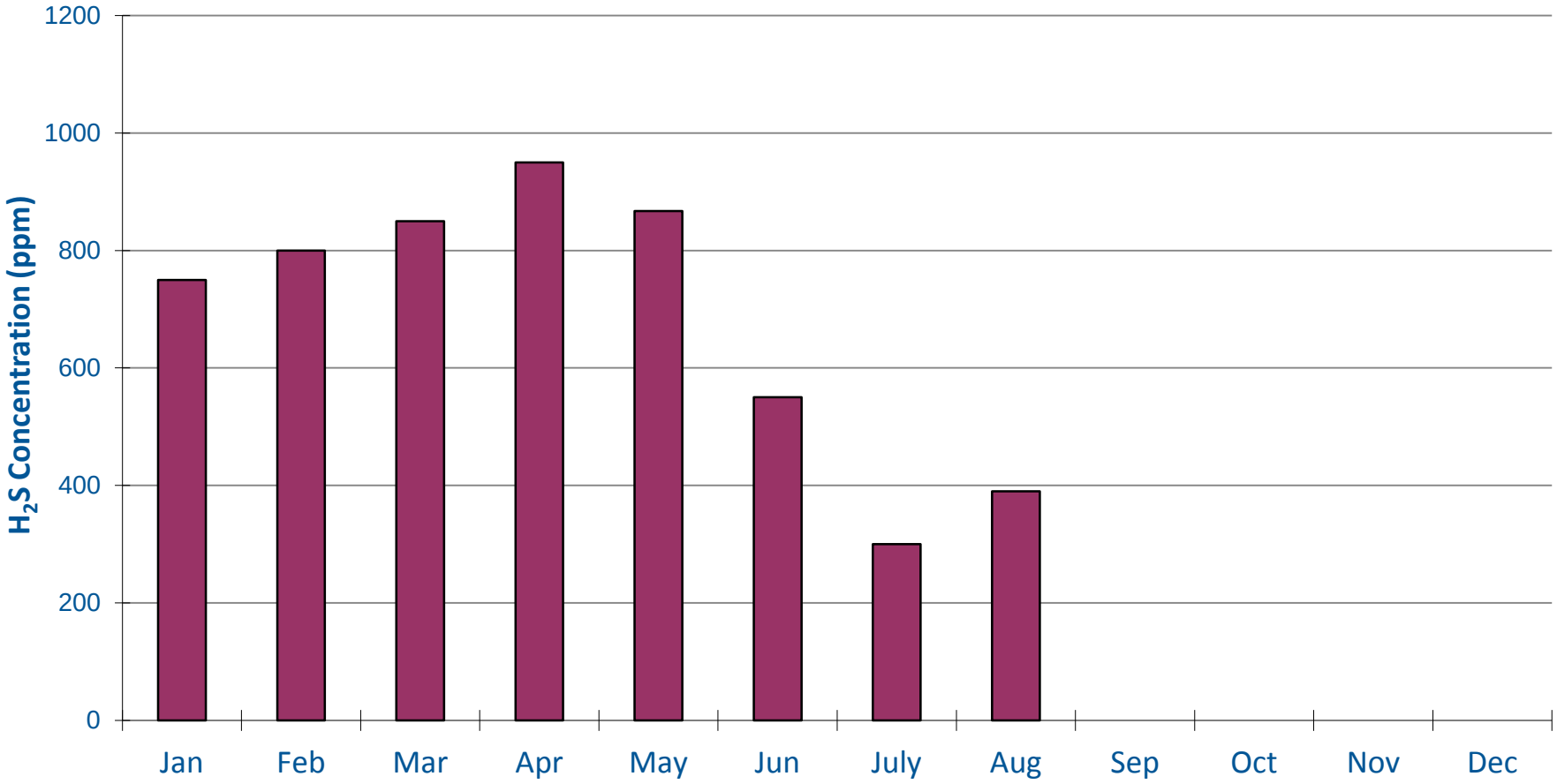
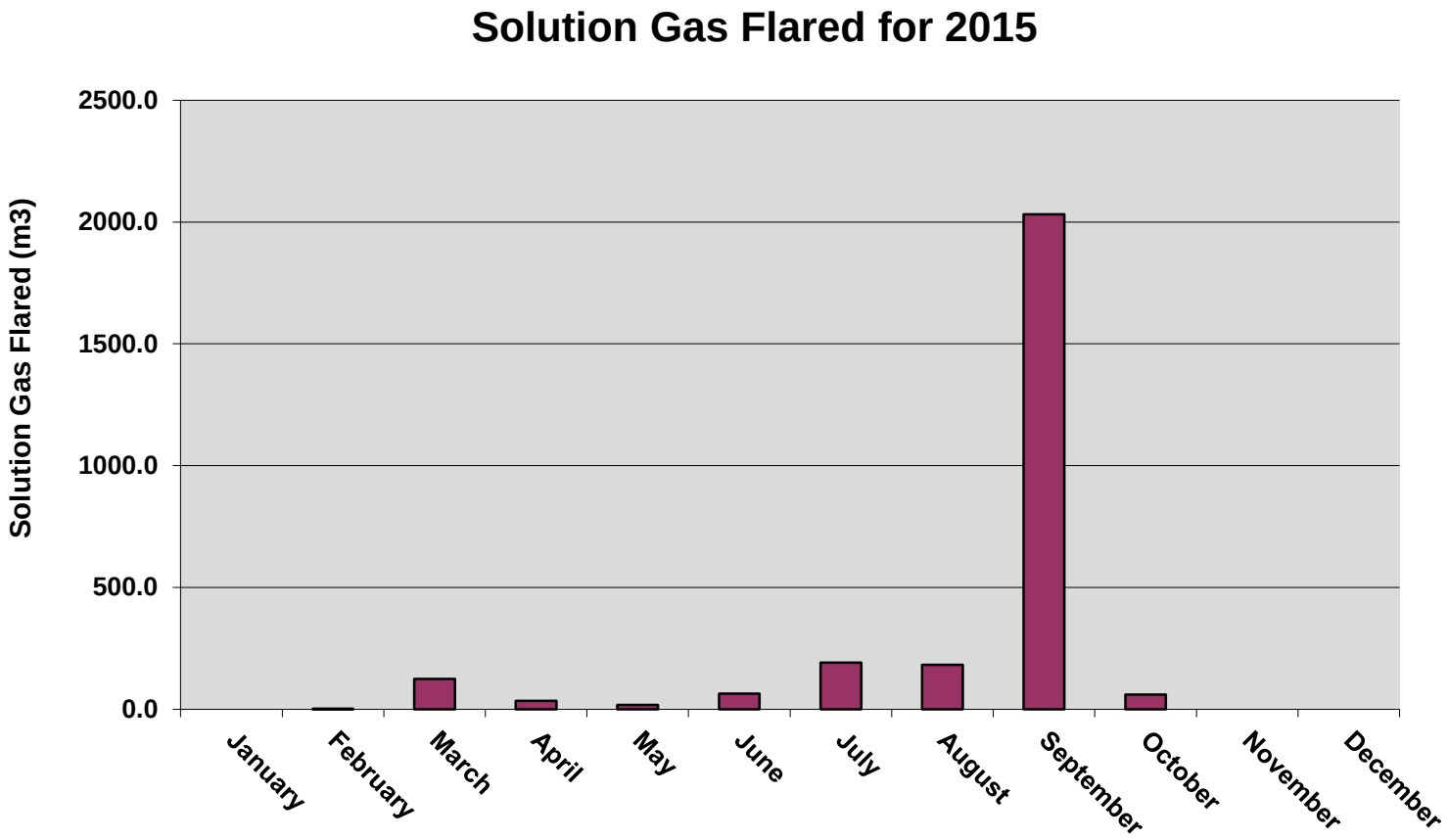
H_2S Concentration (2016 YTD)

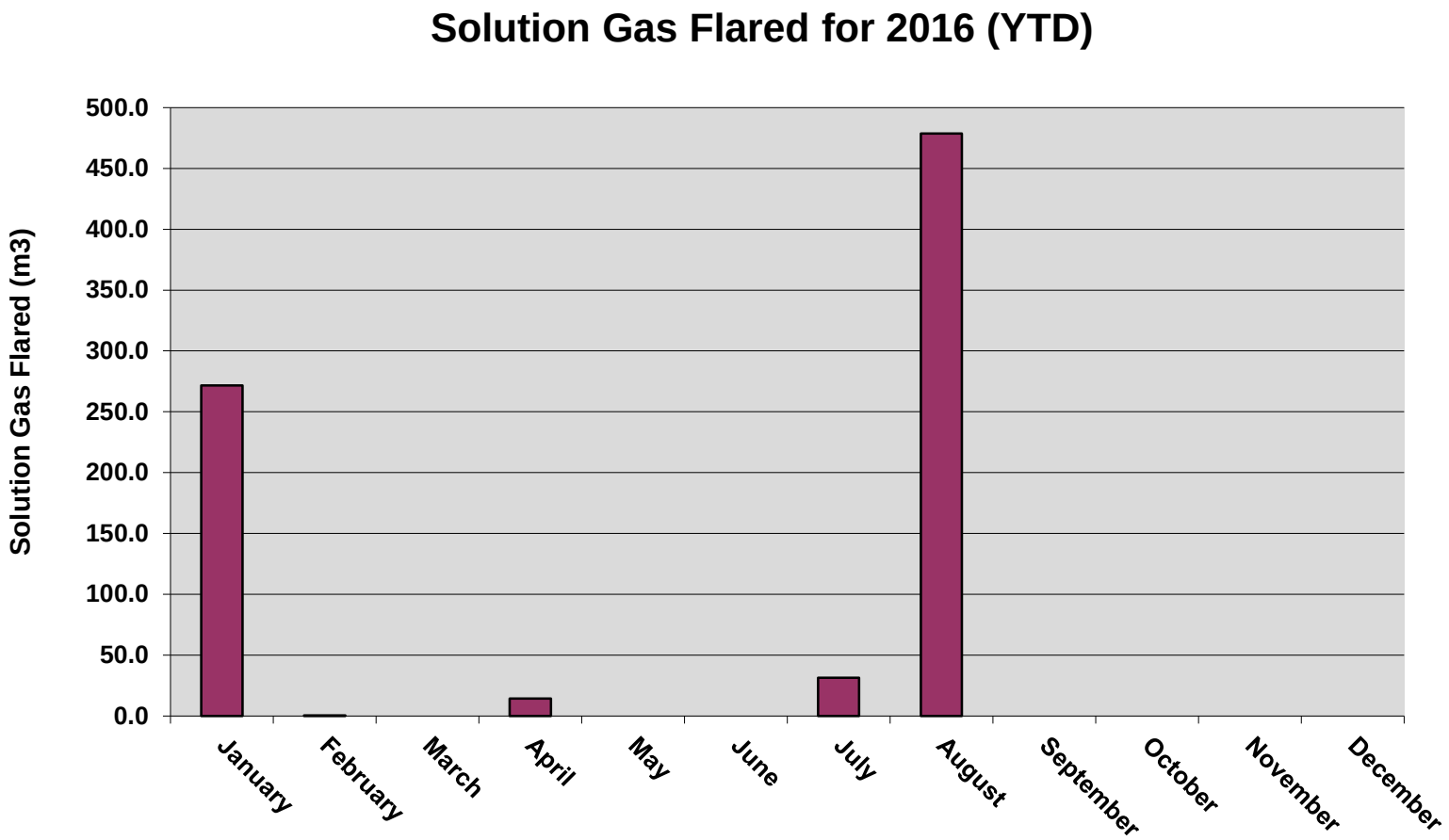


- H_2S concentrations are measured in semi-monthly produced gas samples.

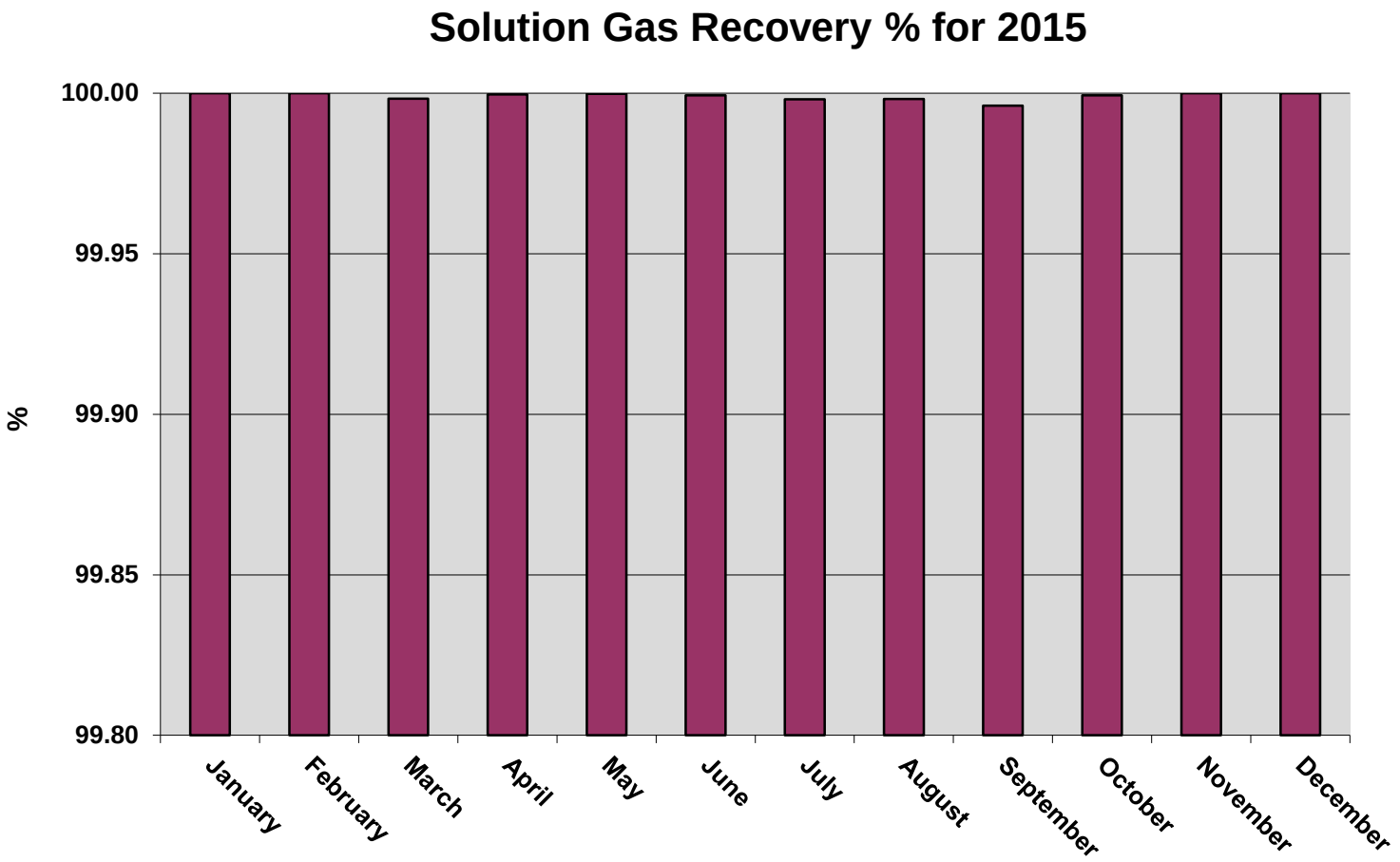
Solution Gas Flared (2015)



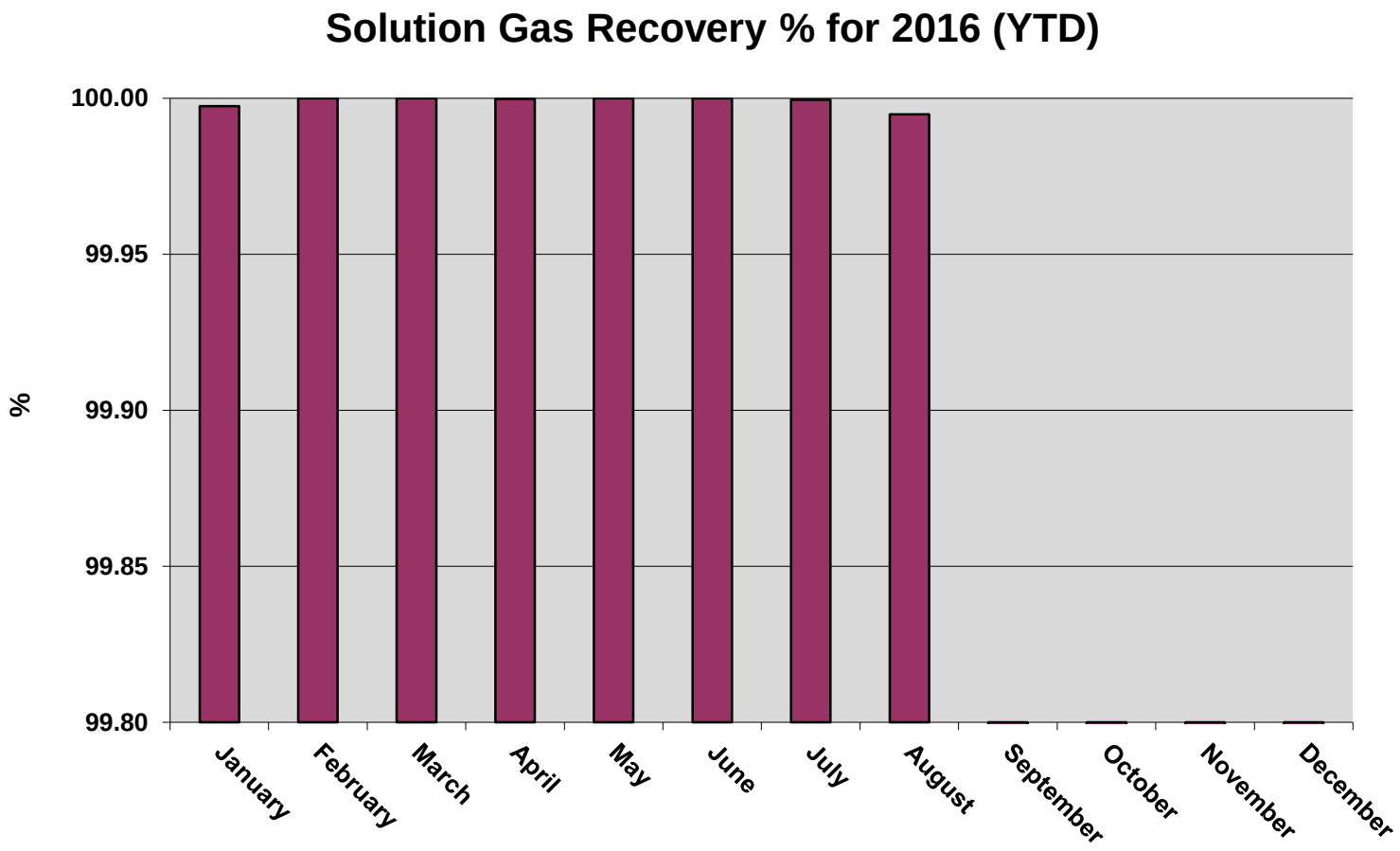
Solution Gas Flared (2016 YTD)



Solution Gas Recovery (2015)



Solution Gas Recovery (2016 YTD)



MacKay River Performance Presentation

Environmental Performance

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Greenhouse Gas Emissions (GHG)

Submitted the annual SGER report to Alberta Environment and Parks and NPRI GHG report to Environment Canada:

- GHG calculation methodology developed to improve transparency.

Total direct emissions for 2015:

- 283,516 tonnes of CO_2equiv;
- Total emissions have been reported to ACCO.

Total direct emissions for 2016 (Budget):

- 302,547 tonnes of CO_2equiv*;
- Total emissions will be reported to ACCO.

Approved baseline emissions intensity:

- 0.1174 tCO_2e/m^3 (Global Warming Potential Updated).

* 2016 actual data to be verified in 2017

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Ambient Air Monitoring

- WBEA Air Monitoring Stations:
  - Ambient air quality data available for viewing on WBEA website.

- Passive Air Monitoring:
  - Four passive air monitoring stations at MacKay River;
  - Monthly passive air monitoring performed by a site representative and sample analysis reports submitted to AER by Suncor for H_2S and SO_2
  - In 2015 passive sampling results showed: average H2S concentration was 0.09 ppb and average SO2 was 0.47 ppb;
  - In 2016 (YTD) passive sampling results showed: average H_2S concentration was 0.11 and average SO2 was 0.56 ppb.

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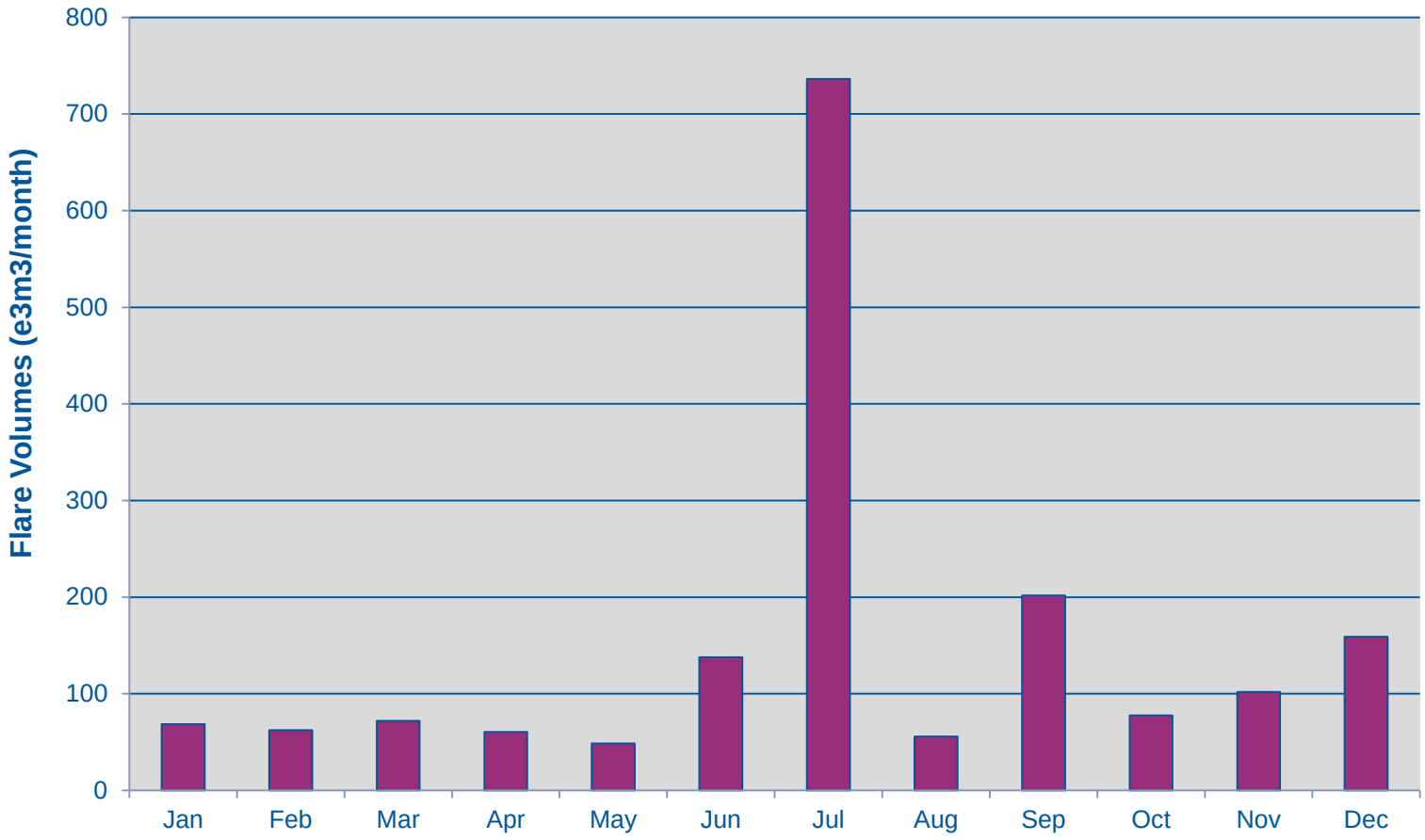
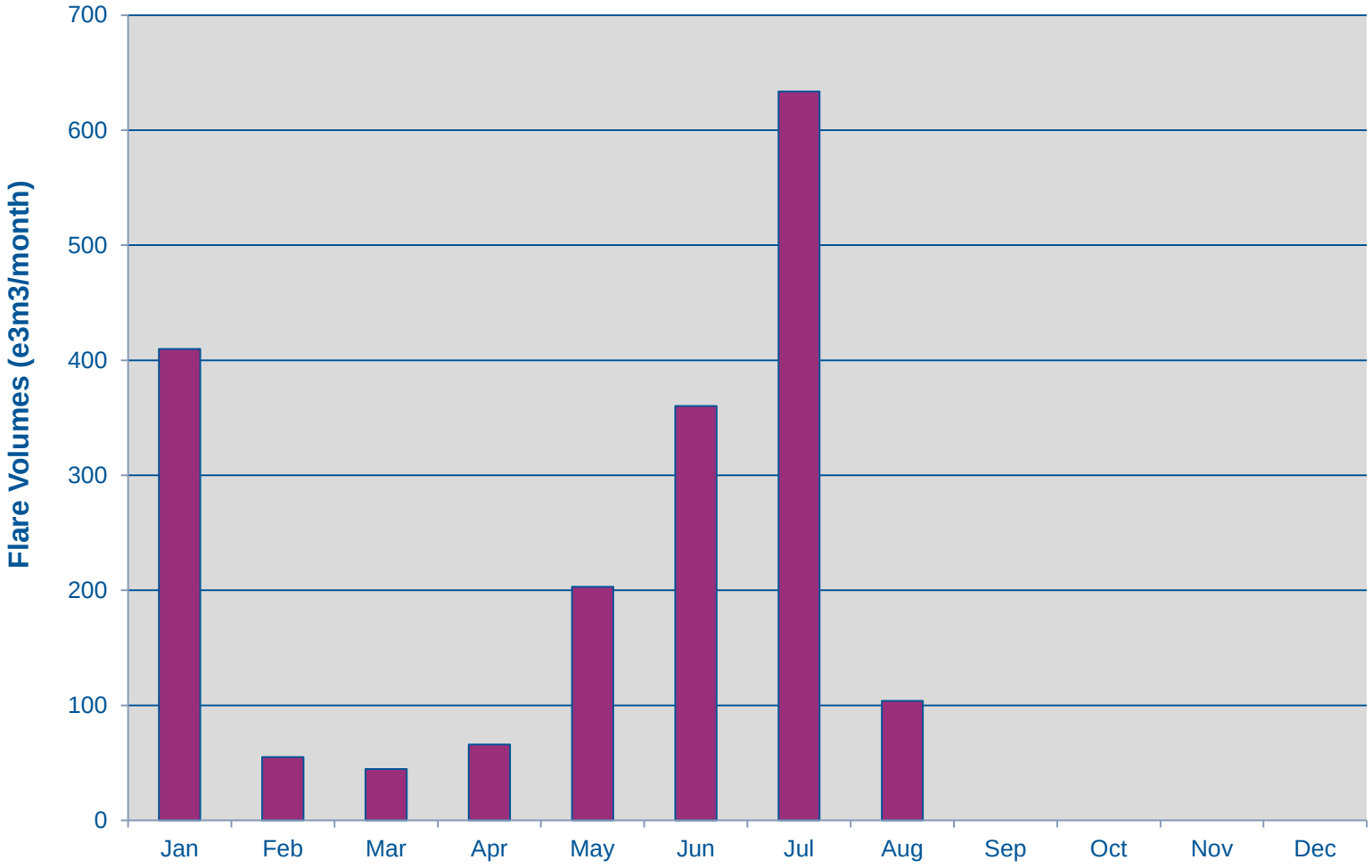
Total Flared Gas (2015)



Total Flared Gas (2016 YTD)



Regulatory Compliance (2015 and 2016 YTD)

AER Site Visits

- **2015:**
  - May 13, 2015: Introduction of new inspector and discussion on transition of reporting from Bonnyville to the Fort McMurray Office.

- **2016:**
  - March 1, 2016: AER site visit to discuss stack testing (Warren Grimes);
  - March 7, 2016: MARP Inspection (Paulette Bugajski);
  - March 16, 2016: Inspection of flow meters on Pads (Tim Chrest);
  - April 12, 2016: Landfill Inspection (Phoebe Thompson);
  - June 14, 2016: Post-Wildfire Inspection (Phoebe Thompson / Kelsey Martin);

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Incident Summary (2015 – 2016 YTD)

AER Reportable Releases for 2015:

- 6 reportable spills;
- 8 reportable flaring events.

AER Reportable Releases for 2016 (YTD – Sept 30):

- 6 reportable spills;
- 8 reportable flaring events.

Voluntary Self Disclosures 2016 (YTD – Sept 30):

- WSW's missing Dataloggers – remediation/installation complete Sept 2016;
- Landfill – tear in liner of Phase II cell – repair complete June 2016.

Environmental Awareness Training:

- Core training requirement;
- Highlights Spill Awareness, Waste Management, Flaring reporting, etc.

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Scheme Approval Amendments

- **Amendment 8668A**
  - Changed annual average volume to 33,000 bpd (5,250 m^3/d)
- **Amendment 8668B**
  - Increase to project area
- **Amendment 8668C**
  - Additional project area
  - Approval to inject non-condensable gas
- **Amendment 8668D**
  - Additions to project area
  - Increase to annual average volume to 72,964 bpd (11,600 m^3/d)
- **Amendment 8668E**
  - Approval to drill four well pairs
- **Amendment 8668F**
  - Approval to change approval holder from Petro-Canada to Suncor
- **Amendment 8668G**
  - Approval to undertake amendments & modifications to CPF systems
  - Approval tie-in 6 well pairs to well testing facilities
- **Amendment 8668H**
  - Approval to conduct non-condensable gas injection test on Pad 21 wells
- **Amendment 8668I**
  - Approval to conduct non-condensable gas injection at the Section 16 Test Project
- **Amendment 8668J**
  - Approval to transfer portions of the Dover project area into the MacKay River project area
- **Amendment 8668K**
  - Approval to tie-in 16 well pairs to well testing facilities
- **Amendment 8668L**
  - Approval to the remove the limiting factor of a mole percent restriction for the B Pattern non-condensable gas injection test on Pad 21
- **Amendment 8668M**
  - Approval to inject chemical into Pad 22 wells
- **Amendment 8668N**
  - Approval to abandon 3 wells and suspend 1 well on Pad 20
- **Amendment 8668O**
  - Approval to change Phase 5F well trajectories
- **Amendment 8668P**
  - Approval to develop Pads 750/751/28 and add 2 sections to project area
- **Amendment 8668Q**
  - Approval to conduct a pilot of water treatment technologies
- **Amendment 8668R**
  - Approval to abandon well G1I
- **Amendment 8668S**
  - Approval to conduct chemical injection test on Pad 21 (D-Pattern Injectors)

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Scheme Approval Amendments

- **Amendment 8668T**
  - Pad 819 Approval
- **Amendment 8668U**
  - Maximum Operating Pressure Approval
- **Amendment 8668V**
  - NCG Expansion Project and Phase 5D/F Chemical Injection Approval
- **Amendment 8668W**
  - MR CPF Expansion Project and Directive 081 Waiver Approval
- **Amendment 8668X**
  - Administrative reissue approval
- **Amendment 8668Y**
  - WHIP for Phases 5B2, 5D and 5F Patterns approval
- **Amendment 8668Z:**
  - Pad 828 change from 3 well pairs to 2 wells pairs and correction of well UWIs on Pad 21 Chemical Injection Test (D-Pattern Injectors) approval issued December 10, 2014.
- **Amendment 8668AA:**
  - Phase 1 NCG design amendment approval issued December 19, 2014.
- **Amendment 8668BB:**
  - Phase 2 and Phase 3 Chemical Co-Injection (E, F and G Patterns) approval issued January 1, 2015.
- **Amendment 8668CC:**
  - Approval for E1P Sidetrack well issued January 27, 2015.
- **Amendment 8668DD:**
  - Approval for NN6P Sidetrack well issued February 3, 2015.
- **Amendment 8668EE:**
  - Approval for VX™ multiphase meter on Pad 824 issued February 19, 2015.
- **Amendment 8668FF:**
  - Approval for NCG Test at OO5I well on pad 24 issued March 17, 2015.
- **Amendment 8668GG:**
  - Approval to conduct CO2 Co-Injection at the OO9 well pair on Pad 24 issued April 13, 2015.
- **Amendment 8668HH:**
  - CO2 Co-Injection amendment to change to OO8 well pair on Pad 24 issued.
- **Amendment 8668II:**
  - Pad 824 Thermal Compatibility Assessment approval issued July 14, 2015.
- **Amendment 8668JJ:**
  - Approval for NCG Test at OO7I issued July 29, 2015.
- **Amendment 8668KK:**
  - Approval for an alternate MOP Strategy Trial.
- **Amendment 8668LL:**
  - Approval for C2IPB Sidetrack Well.
- **Amendment 8668MM:**
  - Approval for Pad 750 Thermal Compatibility Assessment.

Scheme Approval Amendments

- **Amendment 8668NN:**
  - Approval to increase MWHIP for all operating wells.
- **Amendment 8668OO:**
  - Approval to alter DA, DB, DC and DF Pattern MWHIPS;
- **Approval to adjust CO2 co-injection rate;**
  - Approval to extend chemical co-injection test at the D pattern wells on Pad 21.
- **Amendment 8668PP:**
  - Approval for abandonment of A3I.
- **Amendment 8668QQ:**
  - Approval to change Clause 32.

Current Amendments Continued

- **Amendment 8668GG:**
  - Approval to conduct CO_2 Co-Injection at the OO9 well pair on Pad 24 issued April 13, 2015.
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  - CO_2 Co-Injection amendment to change to OO8 well pair on Pad 24 issued.
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  - Approval to change Clause 32.

Current Amendments / Applications

- Currently there are no applications under review that are related to MacKay River;

- Suncor will be submitting a separate scheme approval in Q4 2016 for the In Situ Solvent Demonstration Facility that will be located within the MacKay River project area.

Environmental Initiatives

Suncor supports the Joint Oil Sands Monitoring Program and is also an active member of:

- The Wood Buffalo Environmental Association (WBEA) and its continued work through JOSM;
- The Alberta Biodiversity Monitoring Institute (ABMI);
- The Athabasca Watershed Planning and Advisory Council (AWC-WPAC);
- The Canadian Oil Sands Innovation Alliance (COSIA);
- Mining Association of Canada Toward Sustainable Mining initiative;
- Oil Sands Spill Coop Area Y;
- Alberta Association of Conservation Offsets (AACO).

Suncor is in ongoing consultation with:

- Regional stakeholders;
- Aboriginal Communities and the local Municipality.

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Land Disturbance and Reclamation

- A Project-Level Conservation, Reclamation & Closure Plan is due to AER October 31, 2018. The Plan will follow the new SED-001;
- No reclamation activities are took place in 2015 or are presently underway at MacKay River;

- Total area of land cleared in 2015 was 12.05 ha:
  - Pad 8.24– 4.35 ha;
  - SML 140005 – 7.0 ha;
  - Gathering Line – 0.7 ha.

- Estimated total area of land to be cleared in 2016 is minimal:
  - Minor clearing due to bear safety issues and access that will be included in 2016 Conservation and Reclamation Report;
  - No clearing related to operations;
  - No projected land to be disturbed

Note: Estimated numbers do not include exploration programs and fire related clearing

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Regulatory Compliance

- As noted earlier Suncor has communicated with the AER regarding:
  - Landfill findings (AER Ref#: 312291); and
  - Source groundwater level monitoring (AER Ref #: 308679).

- Suncor Energy Inc. is in compliance with all regulatory approvals, decisions, regulations and conditions as described in Decision Report 2000-50; specifically pertaining to:
  - Plant and waste management facility location,
  - Ground level ozone and VOC monitoring,
  - Groundwater monitoring wells,
  - Surface water quality monitoring, and
  - Participation in Regional Initiatives.

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Summary of Key Learnings (Operations)

- Continued focus on Suncor's Safety Task force initiatives driving and reinforcing correct behaviours:
  - Primary focus on operational discipline and leadership;
  - Dedication to improving onsite process and personal safety.

- Continual focus on process indicators continues high performance of reliability:
  - Record consecutive days without unplanned steam outages;
  - Record consecutive days of on-spec boiler feed water.

- Many learnings from a safety and onsite performance perspective post fire at Mackay River- well performance, pipeline availability, etc.;

- Focus on brine dryer operation has significantly reduced offsite disposal. Further improvements and efficiencies to be realized.

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MacKay River Performance Presentation

Future Plans

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Future Plans

Project Description	Comments	Status
Mackay River optimization .	Unlocking throughput availability with improvements and testing to design	Currently being evaluated.
Pad 750/751 steaming and start-up	Continue with startup of 750 and transition to SAGD.	750 wells currently steaming.

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